INTERNATIONAL PAPER

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February 21, 2017

Mr. Douglas McCurry
Senior Corrective Action Specialist
US Environmental Protection Agency Region 4
Atlanta Federal Center
61 Forsyth Street
Atlanta, GA 30303-8960

Subject: Supplemental Corrective Measures Study - 2016
International Paper – Closed Former Wood Treating Site Units
South First Street, Wiggins, MS, Stone County
HW Permit 980 600 084

Dear Mr. McCurry:

On May 27, 2016, International Paper Company (IP) proposed additional surface water and sediment sample collection and analysis for Church House Branch (AOC B) (May 27, 2016 Additional Sampling Plan) at the Former Wood Treating Units in Wiggins, MS (the Site) in response to US Environmental Protection Agency Region 4 (EPA) comments dated April 26, 2016. The proposed additional sampling and analysis was intended to be the final monitoring at AOC B in order to complete the Corrective Measures Study (CMS) under the Resource Conservation and Recovery Act (RCRA) Correction Action (CA) program at the closed treatment units. EPA approved the May 27, 2016 Additional Sampling Plan for this additional monitoring on June 7, 2016. The results from the implementation of the May 27, 2016 Additional Sampling Plan are provided in this letter report.

The placement of a gravel cover in a designated portion of Treatment Area No. 1 (SWMUs 21-15, 38 and 39) at the Site containing dioxin concentrations in surface soil above human health screening levels was also approved by EPA on June 7, 2016. Documentation of the gravel cover placement is also provided in this letter report.

I. Surface Water

Three surface water samples were collected by IP's consultant, EarthCon Consultants, Inc. (EarthCon) on June 28, 2016. The samples were collected in duplicate directly into laboratory-cleaned and prepared sample bottles by dipping them into the standing water at each location. The three sample locations, SW-1.5, SW-2, and SW-2.5, are shown on **Figure 1**. A field duplicate (SW-3.5) was collected at sample location SW-2. The samples were analyzed for Copper by EPA SW-846 Method 6020 and Total Hardness. One of the duplicate samples from each location was analyzed for total copper and one was filtered (0.45-micron filter) in the laboratory for dissolved copper analysis. The total copper samples were preserved in the field with nitric acid, while the dissolved copper samples were submitted to the laboratory with no preservative added. The surface water samples were preserved with ice in sample coolers and the coolers were shipped via overnight delivery to Pace Analytical Services in St. Rose, LA under

chain-of-custody procedures for analysis. The analytical results were submitted to an EarthCon chemist for data validation. Sample chain-of-custody sheets, EarthCon's field logbook, data validation memo, and laboratory data sheets are provided in **Attachment A**.

A. Copper Results

The validated laboratory results for copper in surface water are listed in **Table 1**. The surface water samples were also analyzed for hardness to support hardness correction in the ecological risk screening, if needed. The hardness results are listed in **Table 1,** however, they were not needed in the ecological risk assessment.

The total and dissolved copper concentrations detected were compared to EPA Region 4 Freshwater ecological screening values (ESVs)[1]. All detected copper concentrations are below the ESVs for both acute and chronic exposures. Since the direct comparison of copper concentrations indicated that the values were below screening levels, no hardness corrections were calculated for these samples.

IP concludes that the original elevated copper in surface water sample at SW-2 in 2015 was not representative of surface water in the Church House Branch due to the elevated turbidity of the surface water where the sample was collected. The results of the additional surface water samples collected in 2016 support this conclusion and supports that no further surface water sampling is required.

II. Sediment

Four discrete sediment samples were collected from the Church House Branch (AOC B) on June 28, 2016. The samples were collected from locations SD-1, SD-3, SD-5, and SD-7 shown on **Figure 1**. The samples were collected in laboratory-cleaned and prepared sample bottles using a stainless-steel trowel. The trowel was decontaminated between sample locations using Alconox, tap water, and distilled water rinses. A field duplicate sample labelled SD-6 was collected from location SD-5, and a field blank, FB-1, was collected consisting of a distilled water rinse of the decontaminated sampling trowel. A matrix spike/matrix spike duplicate (MS/MSD) sample was also collected was for use by the laboratory in their QA/QC procedures. The sediment samples were submitted for Dioxin, Total Organic Carbon (TOC) and Grain Size analysis via EPA SW-846 Method 1613, SW-846 Method 9060, and ASTM Method D2974-87, respectively. The sediment samples were preserved with ice in sample coolers and the coolers were shipped via overnight delivery to the Pace Analytical Services in Minneapolis, MN and Green Bay, WI laboratories under chain-of-custody procedures. The analytical results were submitted to an EarthCon chemist for data validation. Sample chain-of-custody sheets, EarthCon's field logbook, data validation memo, and laboratory reports are provided in **Attachment A**.

A. Dioxin Results

The validated analytical results for dioxin congeners are provided in **Table 2**. The dioxin congener-specific results were weighted using the 2005 World Health Organization

[1] Table 1a Region 4 Surface Water Screening Values for Hazardous Waste Sites, Region 4 Ecological Risk Assessment Supplemental Guidance Interim Draft, United States Environmental Protection Agency Scientific Support Section, Superfund Division, EPA Region 4, August 2015.

(WHO) Consensus Toxicity Equivalent Factors (TEFs)[2] to calculate the PCDD/PCDF Toxicity Equivalent (TEQs) values in **Table 3**. The TEQs were compared to the Freshwater Ecological Screening Values (ESVs) and Remediation Screening Values (RSVs) for Non-Narcotic Modes of Action[3]. The TEQ results were lowest at the upstream/background location (5.8 ng/kg at SD-1) with a higher concentration at SD-3 (5,690 ng/kg), and decreasing concentrations down-gradient at SD-5 (2,410 ng/kg) and at SD-7 (1,130 ng/kg).

Based upon some of these dioxin in sediments analytical results, IP completed an Ecological Risk Assessment Screening. The screening results are discussed below in item II.D and **Attachment B**.

B. TOC Results

The validated analytical results for TOC are provided with the Dioxin results in **Table 2**. The TOC results for the sediment samples collected ranged from 4,540 to 24,400 mg/Kg (0.454% to 2.44%, respectively). The TOC concentrations are relevant when considering contaminant adsorption to sediment and subsequent ecological availability. The greater the TOC concentration, the greater the potential for adsorption to sediment, and the lower the ecological availability.

C. Grain Size Results

The grain size distribution results for the sediment samples are provided in **Attachment A** along with the chain-of-custody sheets, data validation memos and validated laboratory analytical data sheets. No detailed evaluation of the grain size distribution results was conducted at this time. These data are available for future evaluation, if needed.

D. Supplemental Ecological Risk Assessment Screening

The Ecological Risk Evaluation Report in **Attachment B** documents the methodology and results of a screening ecological risk evaluation for the Church House Branch (AOC B) in support of the completion of the RCRA CA CMS. This evaluation assesses potential ecological risks from historical discharges of polychlorinated dibenzo dioxins and furans (PCDD/Fs) from the adjacent wood treating facility into the Church House Branch. The evaluation follows United States Environmental Protection Agency (USEPA) ecological risk assessment guidance and reflects consultation with USEPA Region 4 staff. The results of the screening ecological risk evaluation presented in this report are consistent with the results discussed with USEPA on January 5, 2017.

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[2] Recommended Toxicity Equivalent Factors (TEFs) for Human Health Risk Assessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Dioxin-Like Compounds, United States Environmental Protection Agency, EPA/100/R 10/005, December 2010.

[3] Table 2a EPA Region 4 Sediment Screening Values for Hazardous Waste Sites, Non-Narcotic Modes of Action, Region 4 Ecological Risk Assessment Supplemental Guidance Interim Draft, United States Environmental Protection Agency Scientific Support Section, Superfund Division, EPA Region 4, August 2015.

The purpose of the screening ecological risk evaluation was to determine whether Site-related PCDD/Fs detected in the sediments of Church House Branch need further study to understand ecological risks at the Site, or if the current information is sufficient to determine the residual PCDD/Fs in sediment pose no unacceptable ecological risks. This risk evaluation considers wildlife receptors that are likely to be exposed to PCDD/Fs in Church House Branch and are expected to be the most highly exposed and sensitive among the wildlife species.

This screening risk evaluation evaluated the uptake of PCDD/Fs from the sediments of Church House Branch to the food web consumed by wildlife such as the green heron, the raccoon, and the marsh rice rat. This screening risk evaluation compared dietary exposure estimates to conservative (protective) dietary toxicity no effect and dietary low effect values.

The results of this screening risk evaluation for the green herons, raccoons, and marsh rice rats collectively supports the conclusions that there are no unacceptable risks to mammal and bird populations that feed in Church House Branch and that no further ecological risk evaluation or action is warranted in Church House Branch at this time.

III. Gravel Cover - Surface Soil Above Human Health Screening Level

The analytical results from shallow surface soil (0 to 1-foot depth) located within Treatment Area No. 1 that was initially characterized during the RCRA Facility Investigation (RFI)[4] in 2001, and re-sampled and analyzed by IP in 2008[5], was recently reviewed by EPA. EPA determined that the 2008 dioxin TEF concentrations reported at two locations, GP-12 and GP-14, were above updated residential (150 ng/kg) and/or industrial worker (2,200 ng/kg) human health Risk Management Levels (RMLs)[6] currently being applied by EPA. These two locations are shown on **Figure 2**. The dioxin concentrations and human health screening levels are summarized in **Table 4**.

IP and EPA agreed that these locations would be managed by the placement of a 4 to 6-inch thick gravel cover to restrict human exposure to surface soil. The gravel cover (shown on **Figure 2**) was constructed by Walker-Hill Environmental under subcontract to EarthCon from September 6 to 8, 2016. An EarthCon field technician was on-site to direct the construction. Property owner (Baldwin Pole Mississippi) permission was obtained prior to gravel cover construction. A copy of the construction specification for the gravel cover is included as **Attachment C**. Photographic documentation of the placement of an underlying geotextile layer and the final compacted gravel cover is provided in **Attachment C**.

Actual specifications of the gravel construction are summarized below:

- Gravel cover installation – September 6 – 8, 2016
- Gravel cover area – ~6,000 square feet
- Minimal grading/leveling conducted prior to geotextile placement using skid steer

[4] RCRA Facility Investigation, International Paper Treated Wood Products Plant, Wiggins, MS, 2002.

[5] Dioxin Soil Sampling Report, Former International Paper Wiggins Treated Wood Products Facility, International Paper, December 23, 2008.

[6] US Environmental Protection Agency, Region 4, Atlanta, GA, Dioxin Soil Sampling Report Comments Letter, December 10, 2015.

- Geotextile specification – 100% polypropylene needle-punched nonwoven fabric
- Geotextile placed – ~6,000 square feet, from 1 - 15-foot-wide roll
- Gravel specification – 610 crushed limestone
- Gravel amount – 180 tons, 12 truckloads, approximately 15 tons/load
- Gravel placed using skid steer with rubber tires and shovels
- Gravel compacted using skid steer with rubber tires, minimum two passes
- Gravel cover edges tapered to surrounding ground elevation
- Actual gravel depth – confirmatory measurements collected on September 9, 2016 at 4 corners and middle – 6-8 inches.

IV. Conclusions and Future CMS Activities

Based on the recent work completed and meetings with EPA, IP considers the CMS activities at AOC B complete with no additional soil, surface water, or sediment samples needed at this time.

Please do not hesitate to call me at (901) 419-4447 if you need any additional information or have any questions or comments.

Sincerely,

Brent Sasser

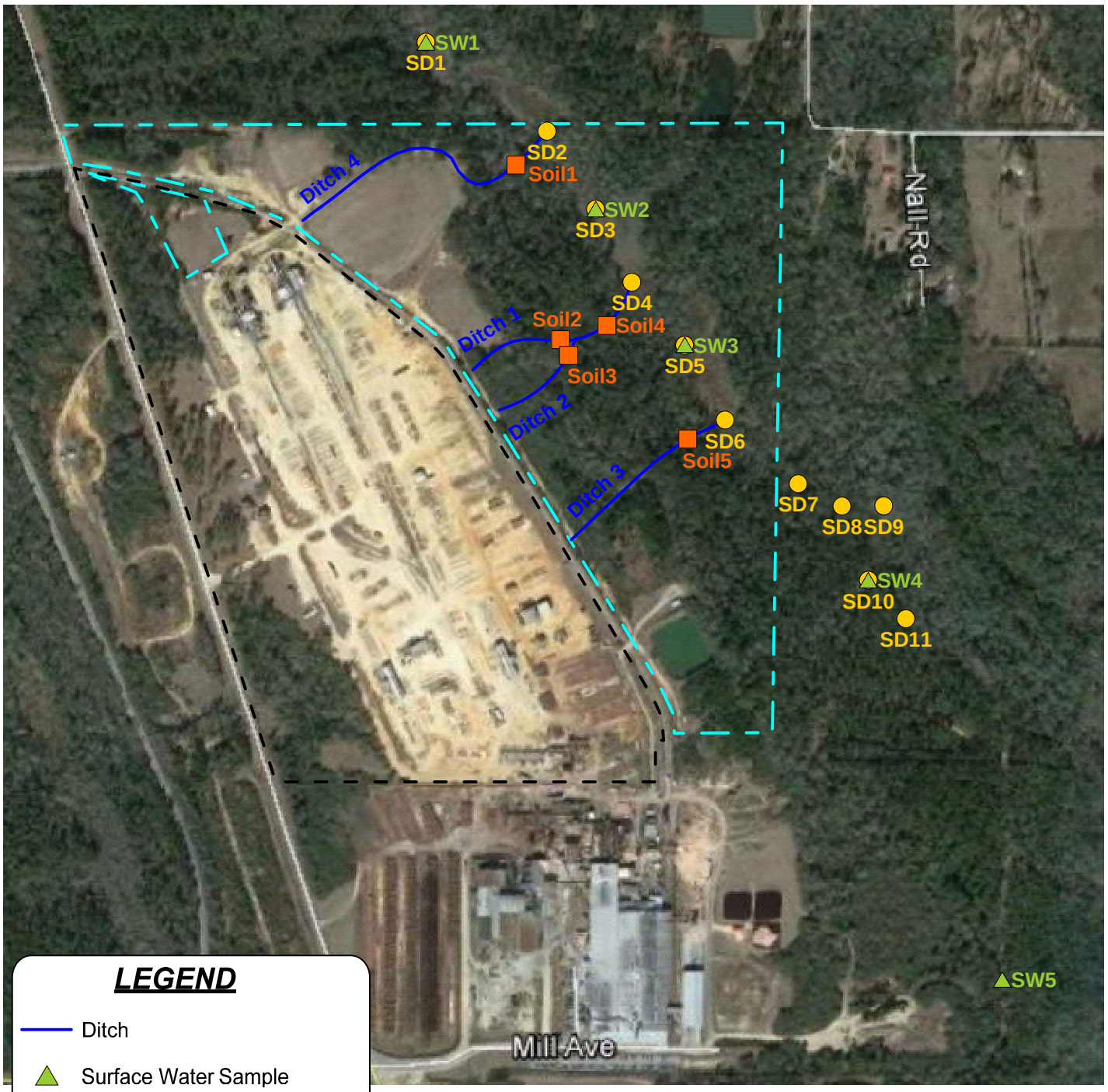
Brent Sasser, P.E.

Attachments:

Figure 1 – Sample Locations – Church House Branch (AOC B)
Figure 2 – Gravel Cover Area – Treatment Area No. 1
Table 1 – Surface Water Analytical Results
Table 2 – Sediment Analytical Results – Dioxin Congeners
Table 3 – Sediment Analytical Results – TEQs
Table 4 – Soil Analytical and Human Health Screening Data - 2001
Attachment A – Field Log, Laboratory Reports, Chain-of-Custody Sheets, Data Validation
Attachment B – Ecological Risk Evaluation Report – Ramboll Environ, February 2017
Attachment C – Gravel Cover Construction Specification and Photographic Documentation

CC: Brett Thomas, EPA Region 4
Emily Lee, International Paper
Norman Kennel, EarthCon Consultants, Inc.
Doug Seely, EarthCon Consultants, Inc.
Mary Sorenson, Ramboll Environ

FIGURES



Note:
Location of SD10 is approximate location of former SD-03
Location of SD9 is approximate location of former SD-04
Location of SD8 is approximate location of former SD-05

International Paper, Inc.-
Former Wood Treating Site
Wiggins, MS
1633 South 1st Street
Wiggins, MS

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Proposed 2015 Sampling Locations

DESIGNED:	CHECKED:	DATE:	FIGURE NO.
DCW	DS	May 15, 2015	Figure 1
DRAWN: DCW	FILE NAME:	SCALE:	

Gravel Cover Area-4-6 inch depth, geotextile underlayer

ONE INCH = 50 FEET

0 50 100

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Former Wood Treating Site Wiggins, MS
1633 South 1st Street Wiggins, MS

PROJECT NO. 02.20000006.16

EARTHCON®

EarthCon Consultants, Inc.

Gravel Cover Area-Treatment Area No. 1

DRAWN:	CHECKED:	DATE:	FIGURE:
CHT	NK	MAY 2016	2

FILENAME: gravel8282016.dwg

TABLES

Table 1. Surface Water Analytical Results
Supplemental CMS
Closed Wood Treatment Facility
Wiggins, MS

Analyte	Units	EPA Table 1a Freshwater Screening Values Chronic	Acute	SW-1.5 6/28/2016	SW-2 6/28/2016	SW-2.5 6/28/2016	SW-3.5 6/28/2016 (SW-2 DUP)
Total Metals							
Copper	mg/L	0.009	0.013	0.0021 J	0.0043	0.0046	0.0043
Dissolved Metals							
Copper, Dissolved	mg/L	0.009	0.013	0.003 U	0.0026 J	0.0032	0.0024 J
Other Constituents							
Total Hardness	mg/L	--	--	10.1	10.9	10.7	11.1
Total Hardness, Dissolved	mg/L	--	--	9.9	10.9	10	10.4

Notes:
Screening values from Draft EPA Region 4 Surface Water Screening Values for Hazardous Waste Sites 2015
DUP - Field duplicate
J - Estimated value
U - Undetected at the listed reporting limit
EB - Equipment blank
-- - no value or result
Results are validated

Prepared by: KJG 7/26/16
Reviewed by: DES 7/26/16

Table 2. Sediment Analytical Results - Dioxin Congeners
Supplemental CMS
Closed Wood Treatment Facility
Wiggins, MS

Analyte	Sediment Units	SD-1 6/28/2016	SD-3 6/28/2016	SD-5 6/28/2016	SD-6 6/28/2016 SD-5 Field Duplicate	SD-7 6/28/2016	FB-1 6/28/2016 Field Blank
PCDD/PCDF							
1,2,3,4,6,7,8-HpCDD	ng/kg	8	240,000 J	94,000	88,000	45,000	51 U pg/L
1,2,3,4,6,7,8-HpCDF	ng/kg	5 U	22,000	14,000	16,000	8,100	51 U pg/L
1,2,3,4,7,8,9-HpCDF	ng/kg	5 U	2,200	1,400	1,800	1,000	51 U pg/L
1,2,3,4,7,8-HxCDD	ng/kg	5 U	1,300	600	660	300	51 U pg/L
1,2,3,4,7,8-HxCDF	ng/kg	5 U	1,200 J	530	600	280	51 U pg/L
1,2,3,6,7,8-HxCDD	ng/kg	5 U	9,800 J	3,300	3,400	1,300	51 U pg/L
1,2,3,6,7,8-HxCDF	ng/kg	5 U	740	440 J,EMPC	470 J,EMPC	250 J,EMPC	51 U pg/L
1,2,3,7,8,9-HxCDD	ng/kg	5 U	2,600	1,500	1,600	720	51 U pg/L
1,2,3,7,8,9-HxCDF	ng/kg	5 U	640	190	210	77	51 U pg/L
1,2,3,7,8-PeCDD	ng/kg	5 U	270	200	220	89	51 U pg/L
1,2,3,7,8-PeCDF	ng/kg	5 U	150 J,EMPC	68	70	25 U	51 U pg/L
2,3,4,6,7,8-HxCDF	ng/kg	5 U	1,400	730	850	390	51 U pg/L
2,3,4,7,8-PeCDF	ng/kg	5 U	810	180	180	84	51 U pg/L
2,3,7,8-TCDD	ng/kg	1 U	47	13	14	10	10 U pg/L
2,3,7,8-TCDF	ng/kg	1 U	82	15	14	7	10 U pg/L
OCDD	ng/kg	130	2,200,000 J	800,000 J	870,000 J,EMPC	390,000 J	100 U pg/L
OCDF	ng/kg	10 U	150,000	46,000	53,000	34,000	100 U pg/L
Total HpCDD	ng/kg	16	370,000 J	160,000	150,000	72,000	51 U pg/L
Total HpCDF	ng/kg	5 U	85,000	49,000	55,000	33,000	51 U pg/L
Total HxCDD	ng/kg	5 U	62,000 J	17,000	18,000	9,900	51 U pg/L
Total HxCDF	ng/kg	5 U	47,000	17,000	19,000	10,000	51 U pg/L
Total PeCDD	ng/kg	5 U	17,000 J	1,900	2,100	2,000	51 U pg/L
Total PeCDF	ng/kg	5 U	15,000	3,800	4,600	2,700	51 U pg/L
Total TCDD	ng/kg	1 U	6,500 J	440	440	800	10 U pg/L
Total TCDF	ng/kg	1 U	3,200	670	730	630	10 U pg/L
Other Constituents							
Mean Total Organic Carbon	mg/kg	4540	5190	24400	25000	8050	1 U ug/L
Percent Moisture	%	20.3	23.7	60.5	62.8	30.3	--

Notes:
Screening values from Draft EPA Region 4 Ecological Technical Advisory Group Sediment Screening Values for Hazardous Waste Sites 2015
ESV - Ecological screening value
RSV - Refinement screening value
J - Estimated value
U - Undetected at the listed reporting limit
-- - no value or result
Results are validated.

Prepared by: KJG 8/3/16
Reviewed by: DES 8/5/16

Table 3. Sediment Analytical Results - TEQs
Supplemental CMS
Closed Wood Treatment Facility
Wiggins, MS

Analyte	Units	EPA Table 2a Non-Narcotic Freshwater Screening Values ESV	RSV	WHO 2005 Consensus TEF	SD-1 6/28/2016		TEQ ND=0	TEQ ND=1/2RL	SD-3 6/28/2016		TEQ	SD-5 6/28/2016		TEQ	SD-6 6/28/2016		TEQ	SD-7 6/28/2016		TEQ ND=0	TEQ ND=1/2RL
PCDD/PCDF															SD-5 FD						
1,2,3,4,6,7,8-HpCDD	ng/kg	--	--	0.01	8		0.08	0.08	240,000	J	2400	94,000		940	88,000		880	45,000		450	450
1,2,3,4,6,7,8-HpCDF	ng/kg	--	--	0.01	5	U	0	0.025	22,000		220	14,000		140	16,000		160	8,100		81	81
1,2,3,4,7,8,9-HpCDF	ng/kg	--	--	0.01	5	U	0	0.025	2,200		22	1,400		14	1,800		18	1,000		10	10
1,2,3,4,7,8-HxCDD	ng/kg	--	--	0.1	5	U	0	0.25	1,300		130	600		60	660		66	300		30	30
1,2,3,4,7,8-HxCDF	ng/kg	--	--	0.1	5	U	0	0.25	1,200	J	120	530		53	600		60	280		28	28
1,2,3,6,7,8-HxCDD	ng/kg	--	--	0.1	5	U	0	0.25	9,800	J	980	3,300		330	3,400		340	1,300		130	130
1,2,3,6,7,8-HxCDF	ng/kg	--	--	0.1	5	U	0	0.25	740		74	440	J, EMPC	44	470	J, EMPC	47	250	J, EMPC	25	25
1,2,3,7,8,9-HxCDD	ng/kg	--	--	0.1	5	U	0	0.25	2,600		260	1,500		150	1,600		160	720		72	72
1,2,3,7,8,9-HxCDF	ng/kg	--	--	0.1	5	U	0	0.25	640		64	190		19	210		21	77		7.7	7.7
1,2,3,7,8-PeCDD	ng/kg	--	--	1	5	U	0	2.5	270		270	200		200	220		220	89		89	89
1,2,3,7,8-PeCDF	ng/kg	--	--	0.03	5	U	0	0.075	150	J, EMPC	4.5	68		2.04	70		2.1	25	U	0	0.375
2,3,4,6,7,8-HxCDF	ng/kg	--	--	0.1	5	U	0	0.25	1,400		140	730		73	850		85	390		39	39
2,3,4,7,8-PeCDF	ng/kg	--	--	0.3	5	U	0	0.75	810		243	180		54	180		54	84		25.2	25.2
2,3,7,8-TCDD	ng/kg	--	--	1	1	U	0	0.5	47		47	13		13	14		14	10		10	10
2,3,7,8-TCDF	ng/kg	--	--	0.1	1	U	0	0.05	82		8.2	15		1.5	14		1.4	7		0.68	0.68
OCDD	ng/kg	--	--	0.0003	130		0.039	0.039	2,200,000	J	660	800,000	J	240	870,000	J, EMPC	261	390,000	J	117	117
OCDF	ng/kg	--	--	0.0003	10	U	0	0.0015	150,000		45	46,000		13.8	53,000		15.9	34,000		10.2	10.2
Total TEQ	ng/kg	2.5	25	--	--		0.121	5.8	--		5,690	--		2,350	--		2,410	--		1,120	1,121

Notes:
WHO 2005 Consensus TEFs from Recommended Toxicity Equivalency Factors for Human Health Risk Assessment of 2,3,7,8-TCDD and Dioxin-like Compounds, USEPA 2010
ESV - Ecological screening value
RSV - Refinement screening value
TEF - Toxicity Equivalency Factor
TEQ - Toxicity Equivalence
FD - Field duplicate
J - Estimated value
U - Undetected at the listed reporting limit
EMPC - Estimated maximum possible concentration
-- - no value or result
Results are validated.
Highlighted values exceed screening levels

Prepared by: KJG 8/4/16
Reviewed by: DES 8/5/16

Table 4. Soil Analytical Results - 2008
Supplemental CMS
Closed Wood Treatment Facility
Wiggins, MS

Analyte	Units	EPA Human Health Screening Risk Management Levels (RMLs) Residential	Industrial	GP-12 0 - 1 inch 10/21/2008	GP-14 0-1 inch 10/21/2008
TEQs	ng/kg	150	2,200	9,860	2,544

Notes:
Soil analytical results from Dioxin Soil Sampling Report, Former International Paper Wiggins Treated Wood Products Facility, International Paper, December 23, 2008.
RMLs from US Environmental Protection Agency, Region 4, Atlanta, GA, Dioxin Soil Sampling Report Comments Letter, December 10, 2015.
TEQs - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxicity Equivalents
Highlighted values exceed RML(s).

Prepared by: DES 9/23/16
Reviewed by: NDK

ATTACHMENT A

Field Log, Laboratory Reports, Chain-of-Custody Sheets, Data Validation

Church House Branch 6/8/15
IP Wiggins 88° humid
soil/sediment/surface water investigation

0945 - L. Sanchez on-site to organize bottleware
1300 - Norm ~~Sandbacks~~ Gary, + Chuck on-site - discuss scope of work / supplies
1330 Tailgate Safety meeting

1430 Arrive at SW-5 -
sandy, ankle deep, no odor
(1435) sample SW-5
N. 30.82672 } +/- 25'
W. 89.11662 }

1520 - Stake out SD-11
N. 30.83119 } +/- 25'
W. 89.11865 }

1525 Arrive at SW-4 + SD-10
(1530) sample SW-4 sand 1½' wide 6" deep no odor
N. 30.83153 } +/- 30'
W. 89.11912 }
1545 Stake out SD-9
N. 30.83280 } +/- 20ft
W. 89.11960 }

Location Church House Branch Date 6/8/15

Project / Client IP Wiggins 85° humid

soil/sediment/surface water investigation

1550 Stake-out SD-8
N 30.83277 } +/- 16'
W. 89.11971 }

1555 Stake-out SD-7
N. 30.83286 } +/- 19'
W. 89.12016 }

1630 Stake-out SD-6
N. 30.83367 } +/- 19'
W. 89.12151 }

1645 Arrive at SW-3 + SD-5
not flowing water - 1ft deep muddy sediment

(1650) sample SW-3
N. 30.83420 } +/- 17 no odor
W. 89.12231 }

1700 Stake-out SD-4
N. 30.83549 } +/- 20'
W. 89.12269 }

1720 Arrive at SW-2 + SD-3
not flowing water - muddy natural organic odor
N. 30.83642 } +/- 21'
W. 89.12424 }

(1740) sample SW-2

(1750) sample SW-6 Dup of SW-2

Church House Branch Date 6/8/15

IP Wiggins 86° humid

soil/sediment/surface water investigation

1800 Arrive at SW-1 and SD-1
4" deep brown sand mud
natural organic odor

(1805) sample SW-1

(1810) sample MS/MSD
N. 30.83797 } +/- 21'
W. 89.12623 }

1815 Stake out SD-2
N. 30.83749 } +/- 18'
W. 89.12493 }

1900 - off-site

Church House Branch 6/9/15
IP Wiggins 73° rain
soil/sediment/surface water invert

0715 - Gary Gum on Site to collect lab - ~~Chestnut~~
0745 Chuck Thibault on site
0800 Laura Sanchez on-site
0945 Locate SD-11 + grain size
(950) sample time - dark gray organic
(1000) - SD-12 - Duplicate SD-11
(1005) - sample time SD-10 Sandy - light brown
(1010) - sample time SD-9 sandy light brown
(1015) - sample time SD-8 mostly sandy dark brown
(1075) sample time SD-7 Sandy light brown
Back to shed to decon/repack
(1120) SD-EB Had to use distilled water okd by Norm

Church House Branch 6/9/15
IP Wiggins 70° rain
soil/sediment/surface water samp

1150 - To Lunch
1330 locate SD-6
(1335) Sample SD-6 + grain size light brown sand/gravel

locate soil-5
N 30.83360 } +/- 25'
W 89.12176 }
(1340) sample soil-5 + grain size
1-3" light brown sand
3-6" reddish brown clayey sand
(1355) SD-5 sample time
brownish-gray organic rich soil
(1400) SD-MS/SD-MSD
(1415) SD-4 sample time
light brn Sand w/gravel
(1430) soil-4 sample time
1-3" sandy -
3-6" reddish/gray sandy clay
N. 30.83520 } +/- 20'
W. 89.12284 }

Location Church House Branch Date 6/9/15

Project / Client IP Wiggins 75°-muggy

sediment/soil/surface water invest.

1530 Back to building to decon/regroup.

1545 - soil EB - Distilled water

1630 - soil 2 sample time
1-2" clay w/ red sand 2-6" gray brown clay

1635 soil MS + soil MSD
N. 30.83469 } +/- 20'
W. 89.12446 }

1645 ~~soil~~ ys soil-3 light brown wet sand
N. 30.83469 } +/- 21'
W. 89.12438 }

1720 - soil-1 + grain size
lt. brown sand

1725 - soil-6 - Duplicate of soil-1
N. 30.83722 } +/- 20'
W. 89.12505 }

1735 SD-3 sample time
dark gray · lots of organics
muck

Church House Branch Date 6/9/15 9

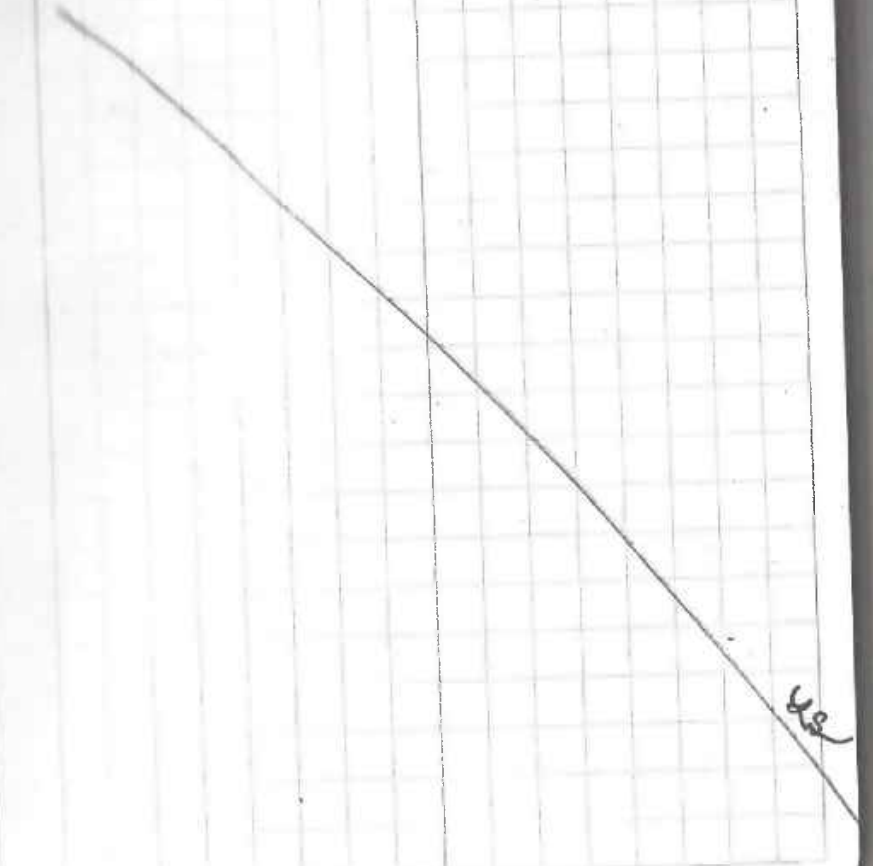
IP Wiggins - 80° sunny

sediment/surface water invest. humid

1745 sample time SD-2
dark gray sand

1755 sampled time SD-1
gray mucky clay w/ organics

1845 off-site



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(504)469-0333

July 19, 2016

Laura Sanchez
EarthCon Consultants, Inc.
900 Holcomb Blvd. Suite B
Ocean Springs, MS 39564

RE: Project: IP Wiggins-CHB
Pace Project No.: 2038933

Dear Laura Sanchez:
Enclosed are the analytical results for sample(s) received by the laboratory on June 29, 2016. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

Some analyses have been subcontracted outside of the Pace Network. The subcontracted laboratory report has been attached.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Melissa MacNaughton

Melissa MacNaughton
Melissa.MacNaughton@pacelabs.com
Project Manager

Enclosures

cc: Accounts Payable, EarthCon Consultants, Inc.

Pace Analytical Services, Inc.
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CERTIFICATIONS

Project: IP Wiggins-CHB
Pace Project No.: 2038933

New Orleans Certification IDs

California Env. Lab Accreditation Program Branch: 11277CA
Florida Department of Health (NELAC): E87595
Illinois Environmental Protection Agency: 0025721
Kansas Department of Health and Environment (NELAC): E-10266
Louisiana Dept. of Environmental Quality (NELAC/LELAP): 02006
Pennsylvania Dept. of Env Protection (NELAC): 68-04202
Texas Commission on Env. Quality (NELAC): T104704405-09-TX
U.S. Dept. of Agriculture Foreign Soil Import: P330-10-00119
Commonwealth of Virginia (TNI): 480246

Green Bay Certification IDs

1241 Bellevue Street, Green Bay, WI 54302
Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
Virginia VELAP ID: 460263
North Dakota Certification #: R-150
South Carolina Certification #: 83006001
Texas Certification #: T104704529-14-1
US Dept of Agriculture #: S-76505
Virginia VELAP Certification ID: 460263
Virginia VELAP ID: 460263
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444

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SAMPLE SUMMARY

Project: IP Wiggins-CHB
Pace Project No.: 2038933

Lab ID	Sample ID	Matrix	Date Collected	Date Received
2038933001	**SW-3.5**	Water	06/28/16 07:30	06/29/16 08:30
2038933002	**SW-2.5**	Water	06/28/16 08:05	06/29/16 08:30
2038933003	**SW-2**	Water	06/28/16 08:25	06/29/16 08:30
2038933004	**SW-1.5**	Water	06/28/16 08:32	06/29/16 08:30
2038933005	**SD-7**	Solid	06/28/16 09:30	06/29/16 08:30
2038933006	**SD-6**	Solid	06/28/16 09:40	06/29/16 08:30
2038933007	**SD-5**	Solid	06/28/16 09:50	06/29/16 08:30
2038933008	**SD-3**	Solid	06/28/16 10:00	06/29/16 08:30
2038933009	**SD-1**	Solid	06/28/16 10:30	06/29/16 08:30
2038933010	**FB-1**	Water	06/28/16 10:30	06/29/16 08:30

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SAMPLE ANALYTE COUNT

Project: IP Wiggins-CHB
Pace Project No.: 2038933

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
2038933001	**SW-3.5**	EPA 6020	KJR	4	PASI-N
		EPA 6020	KJR	4	PASI-N
2038933002	**SW-2.5**	EPA 6020	KJR	4	PASI-N
		EPA 6020	KJR	4	PASI-N
2038933003	**SW-2**	EPA 6020	KJR	4	PASI-N
		EPA 6020	KJR	4	PASI-N
2038933004	**SW-1.5**	EPA 6020	KJR	4	PASI-N
		EPA 6020	KJR	4	PASI-N
2038933005	**SD-7**	ASTM D2974-87	SKW	1	PASI-G
		EPA 9060	TJJ	6	PASI-G
2038933006	**SD-6**	ASTM D2974-87	SKW	1	PASI-G
		EPA 9060	TJJ	6	PASI-G
2038933007	**SD-5**	ASTM D2974-87	SKW	1	PASI-G
		EPA 9060	TJJ	6	PASI-G
2038933008	**SD-3**	ASTM D2974-87	SKW	1	PASI-G
		EPA 9060	TJJ	6	PASI-G
2038933009	**SD-1**	ASTM D2974-87	SKW	1	PASI-G
		EPA 9060	TJJ	6	PASI-G
2038933010	**FB-1**	EPA 9060	TAE	5	PASI-N

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PROJECT NARRATIVE

Project: IP Wiggins-CHB
Pace Project No.: 2038933

Method: **EPA 6020**
Description: 6020 MET ICPMS
Client: EarthCon Jackson, MS
Date: July 19, 2016

General Information:
4 samples were analyzed for EPA 6020. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 3010 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: IP Wiggins-CHB
Pace Project No.: 2038933

Method: **EPA 6020**
Description: 6020 MET ICPMS, Dissolved (LF)
Client: EarthCon Jackson, MS
Date: July 19, 2016

General Information:
4 samples were analyzed for EPA 6020. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 3005A with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: IP Wiggins-CHB
Pace Project No.: 2038933

Method: **EPA 9060**
Description: Total Organic Carbon Quad
Client: EarthCon Jackson, MS
Date: July 19, 2016

General Information:
5 samples were analyzed for EPA 9060. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: IP Wiggins-CHB
Pace Project No.: 2038933

Method: **EPA 9060**
Description: Total Organic Carbon, Quad
Client: EarthCon Jackson, MS
Date: July 19, 2016

General Information:
1 sample was analyzed for EPA 9060. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

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ANALYTICAL RESULTS

Project: IP Wiggins-CHB
Pace Project No.: 2038933

Sample: SW-3.5 **Lab ID: 2038933001** Collected: 06/28/16 07:30 Received: 06/29/16 08:30 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010								
Calcium	**3.2**	mg/L	0.10	0.050	1	06/30/16 19:00	07/08/16 12:26	7440-70-2	
Copper	**0.0043**	mg/L	0.0030	0.0015	1	06/30/16 19:00	07/08/16 12:26	7440-50-8	
Magnesium	**0.73**	mg/L	0.10	0.050	1	06/30/16 19:00	07/08/16 12:26	7439-95-4	
Total Hardness	**11.1**	mg/L	0.0050	0.0025	1	06/30/16 19:00	07/08/16 12:26		
6020 MET ICPMS, Dissolved (LF)	Analytical Method: EPA 6020 Preparation Method: EPA 3005A								
Calcium, Dissolved	**3.0**	mg/L	0.10	0.050	1	06/30/16 19:10	07/08/16 11:44	7440-70-2	
Copper, Dissolved	**0.0024J**	mg/L	0.0030	0.0015	1	06/30/16 19:10	07/08/16 11:44	7440-50-8	
Magnesium, Dissolved	**0.67**	mg/L	0.10	0.050	1	06/30/16 19:10	07/08/16 11:44	7439-95-4	
Total Hardness, Dissolved	**10.4**	mg/L			1	06/30/16 19:10	07/08/16 11:44		

Sample: SW-2.5 **Lab ID: 2038933002** Collected: 06/28/16 08:05 Received: 06/29/16 08:30 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010								
Calcium	**3.1**	mg/L	0.10	0.050	1	06/30/16 19:00	07/08/16 12:03	7440-70-2	
Copper	**0.0046**	mg/L	0.0030	0.0015	1	06/30/16 19:00	07/08/16 12:03	7440-50-8	
Magnesium	**0.71**	mg/L	0.10	0.050	1	06/30/16 19:00	07/08/16 12:03	7439-95-4	
Total Hardness	**10.7**	mg/L	0.0050	0.0025	1	06/30/16 19:00	07/08/16 12:03		
6020 MET ICPMS, Dissolved (LF)	Analytical Method: EPA 6020 Preparation Method: EPA 3005A								
Calcium, Dissolved	**2.9**	mg/L	0.10	0.050	1	06/30/16 19:10	07/08/16 11:28	7440-70-2	M1
Copper, Dissolved	**0.0032**	mg/L	0.0030	0.0015	1	06/30/16 19:10	07/08/16 11:28	7440-50-8	
Magnesium, Dissolved	**0.66**	mg/L	0.10	0.050	1	06/30/16 19:10	07/08/16 11:28	7439-95-4	
Total Hardness, Dissolved	**10.0**	mg/L			1	06/30/16 19:10	07/08/16 11:28		

Sample: SW-2 **Lab ID: 2038933003** Collected: 06/28/16 08:25 Received: 06/29/16 08:30 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010								
Calcium	**3.2**	mg/L	0.10	0.050	1	06/30/16 19:00	07/08/16 12:30	7440-70-2	
Copper	**0.0043**	mg/L	0.0030	0.0015	1	06/30/16 19:00	07/08/16 12:30	7440-50-8	
Magnesium	**0.71**	mg/L	0.10	0.050	1	06/30/16 19:00	07/08/16 12:30	7439-95-4	
Total Hardness	**10.9**	mg/L	0.0050	0.0025	1	06/30/16 19:00	07/08/16 12:30		
6020 MET ICPMS, Dissolved (LF)	Analytical Method: EPA 6020 Preparation Method: EPA 3005A								
Calcium, Dissolved	**3.2**	mg/L	0.10	0.050	1	06/30/16 19:10	07/08/16 11:47	7440-70-2	
Copper, Dissolved	**0.0026J**	mg/L	0.0030	0.0015	1	06/30/16 19:10	07/08/16 11:47	7440-50-8	
Magnesium, Dissolved	**0.71**	mg/L	0.10	0.050	1	06/30/16 19:10	07/08/16 11:47	7439-95-4	
Total Hardness, Dissolved	**10.9**	mg/L			1	06/30/16 19:10	07/08/16 11:47		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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ANALYTICAL RESULTS

Project: IP Wiggins-CHB
Pace Project No.: 2038933

Sample: SW-1.5 **Lab ID: 2038933004** Collected: 06/28/16 08:32 Received: 06/29/16 08:30 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010								
Calcium	**2.9**	mg/L	0.10	0.050	1	06/30/16 19:00	07/08/16 12:33	7440-70-2	
Copper	**0.0021J**	mg/L	0.0030	0.0015	1	06/30/16 19:00	07/08/16 12:33	7440-50-8	
Magnesium	**0.70**	mg/L	0.10	0.050	1	06/30/16 19:00	07/08/16 12:33	7439-95-4	
Total Hardness	**10.1**	mg/L	0.0050	0.0025	1	06/30/16 19:00	07/08/16 12:33		
6020 MET ICPMS, Dissolved (LF)	Analytical Method: EPA 6020 Preparation Method: EPA 3005A								
Calcium, Dissolved	**2.9**	mg/L	0.10	0.050	1	06/30/16 19:10	07/08/16 11:59	7440-70-2	
Copper, Dissolved	ND	mg/L	0.0030	0.0015	1	06/30/16 19:10	07/08/16 11:59	7440-50-8	
Magnesium, Dissolved	**0.68**	mg/L	0.10	0.050	1	06/30/16 19:10	07/08/16 11:59	7439-95-4	
Total Hardness, Dissolved	**9.9**	mg/L			1	06/30/16 19:10	07/08/16 11:59		

Sample: SD-7 **Lab ID: 2038933005** Collected: 06/28/16 09:30 Received: 06/29/16 08:30 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**30.3**	%	0.10	0.10	1		07/05/16 11:42		
Total Organic Carbon Quad	Analytical Method: EPA 9060								
Total Organic Carbon	**8050**	mg/kg	1210	363	1		07/14/16 07:27	7440-44-0	
Total Organic Carbon	**8150**	mg/kg	1200	360	1		07/14/16 07:32	7440-44-0	
Total Organic Carbon	**8230**	mg/kg	1220	366	1		07/14/16 07:39	7440-44-0	
Total Organic Carbon	**7760**	mg/kg	1210	362	1		07/14/16 07:45	7440-44-0	
Mean Total Organic Carbon	**8050**	mg/kg	1210	363	1		07/14/16 07:27	7440-44-0	
Surrogates									
RSD%	**2.6**	%			1		07/14/16 07:27		

Sample: SD-6 **Lab ID: 2038933006** Collected: 06/28/16 09:40 Received: 06/29/16 08:30 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**62.8**	%	0.10	0.10	1		07/05/16 11:52		
Total Organic Carbon Quad	Analytical Method: EPA 9060								
Total Organic Carbon	**21600**	mg/kg	2990	896	1		07/14/16 07:51	7440-44-0	
Total Organic Carbon	**28500**	mg/kg	3040	911	1		07/14/16 07:58	7440-44-0	
Total Organic Carbon	**25000**	mg/kg	2990	897	1		07/14/16 08:04	7440-44-0	
Total Organic Carbon	**25000**	mg/kg	3010	903	1		07/14/16 08:11	7440-44-0	
Mean Total Organic Carbon	**25000**	mg/kg	3010	902	1		07/14/16 07:51	7440-44-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: IP Wiggins-CHB
Pace Project No.: 2038933

Sample: SD-6 **Lab ID: 2038933006** Collected: 06/28/16 09:40 Received: 06/29/16 08:30 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Total Organic Carbon Quad	Analytical Method: EPA 9060								
Surrogates									
RSD%	**11.3**	%			1		07/14/16 07:51		

Sample: SD-5 **Lab ID: 2038933007** Collected: 06/28/16 09:50 Received: 06/29/16 08:30 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**60.5**	%	0.10	0.10	1		07/05/16 11:53		
Total Organic Carbon Quad	Analytical Method: EPA 9060								
Total Organic Carbon	**23000**	mg/kg	2000	601	1		07/14/16 08:17	7440-44-0	
Total Organic Carbon	**22600**	mg/kg	2020	606	1		07/14/16 08:24	7440-44-0	
Total Organic Carbon	**26100**	mg/kg	1960	588	1		07/14/16 08:31	7440-44-0	
Total Organic Carbon	**25800**	mg/kg	2000	599	1		07/14/16 08:39	7440-44-0	
Mean Total Organic Carbon	**24400**	mg/kg	1990	598	1		07/14/16 08:17	7440-44-0	
Surrogates									
RSD%	**7.4**	%			1		07/14/16 08:17		

Sample: SD-3 **Lab ID: 2038933008** Collected: 06/28/16 10:00 Received: 06/29/16 08:30 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**23.7**	%	0.10	0.10	1		07/05/16 11:53		
Total Organic Carbon Quad	Analytical Method: EPA 9060								
Total Organic Carbon	**4640**	mg/kg	646	194	1		07/14/16 08:47	7440-44-0	
Total Organic Carbon	**5290**	mg/kg	649	195	1		07/14/16 08:53	7440-44-0	
Total Organic Carbon	**5720**	mg/kg	653	196	1		07/14/16 09:05	7440-44-0	
Total Organic Carbon	**5120**	mg/kg	647	194	1		07/14/16 09:11	7440-44-0	
Mean Total Organic Carbon	**5190**	mg/kg	649	195	1		07/14/16 08:47	7440-44-0	
Surrogates									
RSD%	**8.6**	%			1		07/14/16 08:47		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: IP Wiggins-CHB
Pace Project No.: 2038933

Sample: SD-1 **Lab ID: 2038933009** Collected: 06/28/16 10:30 Received: 06/29/16 08:30 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**20.3**	%	0.10	0.10	1		07/05/16 11:53		
Total Organic Carbon Quad	Analytical Method: EPA 9060								
Total Organic Carbon	**3190**	mg/kg	642	193	1		07/14/16 10:05	7440-44-0	
Total Organic Carbon	**4530**	mg/kg	652	196	1		07/14/16 10:11	7440-44-0	
Total Organic Carbon	**5300**	mg/kg	645	194	1		07/14/16 10:17	7440-44-0	
Total Organic Carbon	**5150**	mg/kg	650	195	1		07/14/16 10:23	7440-44-0	
Mean Total Organic Carbon	**4540**	mg/kg	648	194	1		07/14/16 10:05	7440-44-0	
Surrogates									
RSD%	**21.2**	%			1		07/14/16 10:05		

Sample: FB-1 **Lab ID: 2038933010** Collected: 06/28/16 10:30 Received: 06/29/16 08:30 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Total Organic Carbon, Quad	Analytical Method: EPA 9060								
Total Organic Carbon	ND	mg/L	1.0	0.50	1		07/19/16 09:49	7440-44-0	
Total Organic Carbon	ND	mg/L	1.0	0.50	1		07/19/16 09:49	7440-44-0	
Total Organic Carbon	ND	mg/L	1.0	0.50	1		07/19/16 09:49	7440-44-0	
Total Organic Carbon	ND	mg/L	1.0	0.50	1		07/19/16 09:49	7440-44-0	
Mean Total Organic Carbon	ND	mg/L	1.0	0.50	1		07/19/16 09:49	7440-44-0	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1000 Riverbend Blvd - Suite F
St. Rose, LA 70087
(504)469-0333

QUALITY CONTROL DATA

Project: IP Wiggins-CHB
Pace Project No.: 2038933

QC Batch: 57819 Analysis Method: EPA 6020
QC Batch Method: EPA 3010 Analysis Description: 6020 MET
Associated Lab Samples: 2038933001, 2038933002, 2038933003, 2038933004

METHOD BLANK: 238961 Matrix: Water
Associated Lab Samples: 2038933001, 2038933002, 2038933003, 2038933004

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Calcium	mg/L	ND	0.10	0.050	07/08/16 11:20	
Copper	mg/L	ND	0.0030	0.0015	07/08/16 11:20	
Magnesium	mg/L	ND	0.10	0.050	07/08/16 11:20	
Total Hardness	mg/L	0.0026J	0.0050	0.0025	07/08/16 11:20	

LABORATORY CONTROL SAMPLE: 238962

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Calcium	mg/L	2	2.2	109	80-120	
Copper	mg/L	.02	0.022	112	80-120	
Magnesium	mg/L	2	2.2	111	80-120	
Total Hardness	mg/L		14.6			

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 239132 239133

Parameter	Units	2038933002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Calcium	mg/L	3.1	2	2	5.2	5.1	105	98	80-120	3	20	
Copper	mg/L	0.0046	.02	.02	0.026	0.026	107	106	80-120	0	20	
Magnesium	mg/L	0.71	2	2	2.9	2.9	111	107	80-120	2	20	
Total Hardness	mg/L	10.7			25.1	24.5				3	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1000 Riverbend Blvd - Suite F
St. Rose, LA 70087
(504)469-0333

QUALITY CONTROL DATA

Project: IP Wiggins-CHB
Pace Project No.: 2038933

QC Batch: 57807 Analysis Method: EPA 6020
QC Batch Method: EPA 3005A Analysis Description: 6020 MET Dissolved
Associated Lab Samples: 2038933001, 2038933002, 2038933003, 2038933004

METHOD BLANK: 238910 Matrix: Water
Associated Lab Samples: 2038933001, 2038933002, 2038933003, 2038933004

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Calcium, Dissolved	mg/L	ND	0.10	0.050	07/08/16 11:13	
Copper, Dissolved	mg/L	ND	0.0030	0.0015	07/08/16 11:13	
Magnesium, Dissolved	mg/L	ND	0.10	0.050	07/08/16 11:13	

LABORATORY CONTROL SAMPLE: 238911

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Calcium, Dissolved	mg/L	2	2.0	98	80-120	
Copper, Dissolved	mg/L	.02	0.020	100	80-120	
Magnesium, Dissolved	mg/L	2	2.0	101	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 239144 239145

Parameter	Units	2038933002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Calcium, Dissolved	mg/L	2.9	2	2	5.3	5.6	118	133	75-125	6	20	M1
Copper, Dissolved	mg/L	0.0032	.02	.02	0.025	0.027	109	118	75-125	7	20	
Magnesium, Dissolved	mg/L	0.66	2	2	3.0	3.1	115	122	75-125	5	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1000 Riverbend Blvd - Suite F
St. Rose, LA 70087
(504)469-0333

QUALITY CONTROL DATA

Project: IP Wiggins-CHB
Pace Project No.: 2038933

QC Batch: 228981 Analysis Method: ASTM D2974-87
QC Batch Method: ASTM D2974-87 Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 2038933005, 2038933006, 2038933007, 2038933008, 2038933009

SAMPLE DUPLICATE: 1359609

Parameter	Units	40134718001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	7.5	7.4	1	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1000 Riverbend Blvd - Suite F
St. Rose, LA 70087
(504)469-0333

QUALITY CONTROL DATA

Project: IP Wiggins-CHB
Pace Project No.: 2038933

QC Batch: 229715 Analysis Method: EPA 9060
QC Batch Method: EPA 9060 Analysis Description: 9060 TOC Average
Associated Lab Samples: 2038933005, 2038933006, 2038933007, 2038933008, 2038933009

METHOD BLANK: 1362892 Matrix: Solid
Associated Lab Samples:

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Mean Total Organic Carbon	mg/kg	ND	647	194	07/14/16 06:41	

LABORATORY CONTROL SAMPLE: 1362893

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mean Total Organic Carbon	mg/kg	120000	115000	96	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1362894 1362895

Parameter	Units	2038933008 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mean Total Organic Carbon	mg/kg	5190	7870	7860	14300	14700	96	100	50-150	2	30	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1000 Riverbend Blvd - Suite F
St. Rose, LA 70087
(504)469-0333

QUALITY CONTROL DATA

Project: IP Wiggins-CHB
Pace Project No.: 2038933

QC Batch: 59183 Analysis Method: EPA 9060
QC Batch Method: EPA 9060 Analysis Description: 9060 TOC
Associated Lab Samples: 2038933010

METHOD BLANK: 244392 Matrix: Water
Associated Lab Samples: 2038933010

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Total Organic Carbon	mg/L	ND	1.0	0.50	07/19/16 09:00	

LABORATORY CONTROL SAMPLE: 244393

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Organic Carbon	mg/L	20.1	19.8	99	90-110	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1000 Riverbend Blvd - Suite F
St. Rose, LA 70087
(504)469-0333

QUALIFIERS

Project: IP Wiggins-CHB
Pace Project No.: 2038933

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The Nelac Institute

LABORATORIES

PASI-G	Pace Analytical Services - Green Bay
PASI-N	Pace Analytical Services - New Orleans

ANALYTE QUALIFIERS

M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

Pace Analytical Services, Inc.
1000 Riverbend Blvd - Suite F
St. Rose, LA 70087
(504)469-0333

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: IP Wiggins-CHB
Pace Project No.: 2038933

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
2038933001	**SW-3.5**	EPA 3010	57819	EPA 6020	57962
2038933002	**SW-2.5**	EPA 3010	57819	EPA 6020	57962
2038933003	**SW-2**	EPA 3010	57819	EPA 6020	57962
2038933004	**SW-1.5**	EPA 3010	57819	EPA 6020	57962
2038933001	**SW-3.5**	EPA 3005A	57807	EPA 6020	57960
2038933002	**SW-2.5**	EPA 3005A	57807	EPA 6020	57960
2038933003	**SW-2**	EPA 3005A	57807	EPA 6020	57960
2038933004	**SW-1.5**	EPA 3005A	57807	EPA 6020	57960
2038933005	**SD-7**	ASTM D2974-87	228981		
2038933006	**SD-6**	ASTM D2974-87	228981		
2038933007	**SD-5**	ASTM D2974-87	228981		
2038933008	**SD-3**	ASTM D2974-87	228981		
2038933009	**SD-1**	ASTM D2974-87	228981		
2038933005	**SD-7**	EPA 9060	229715		
2038933005	**SD-7**	EPA 9060	229716		
2038933006	**SD-6**	EPA 9060	229715		
2038933006	**SD-6**	EPA 9060	229716		
2038933007	**SD-5**	EPA 9060	229715		
2038933007	**SD-5**	EPA 9060	229716		
2038933008	**SD-3**	EPA 9060	229715		
2038933008	**SD-3**	EPA 9060	229716		
2038933009	**SD-1**	EPA 9060	229715		
2038933009	**SD-1**	EPA 9060	229716		
2038933010	**FB-1**	EPA 9060	59183		

Pace Analytical

CHAIN-OF-CUSTOD

The Chain-of-Custody is a LEG

ly.

WO# : 2038933

2038933

Page : 1 Of 1

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	EarthCon	Report To:	Sanchez, Laura	Attention:	Accts Payable - EarthCon
Address:	36441 Jefferson St.	Copy To:	Kgunderson@earthcon.com	Company Name:	1880 West Oak Pkwy Bldg 100
	Slidell, LA 70460			Address:	Suite 106, Marietta, GA 30062
Email:	lsanchez@earthcon.com	Purchase Order #:		Pace Quote:	
Phone:	985-788-4921 Fax:	Project Name:	Earthcon	Pace Project Manager:	melissa.macnaughton@pacelabs.com,
Requested Due Date:	Standard TAT	Project #:	Wiggins IP - CHB 08	Pace Profile #:	7600

Regulatory Agency

State / Location: MS

ITEM #	SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique)	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Dioxin High Res 8290	TOC 9060	Grain Size D422-sub	Dioxin by 8290 (High res.)	TOC 9060	6020- Copper and Hardness	6020-Diss Cu and Hardness	Various	Residual Chlorine (Y/N)
	MATRIX: Drinking Water DW, Water WT, Waste Water WW, Product P, Soil/Solid SL, Oil OL, Wipe WP, Air AR, Other OT, Tissue TS									Requested Analysis Filtered (Y/N)								Y									
1	SW -3.5	WT	G	6/28	730				2	X		X												X	X		
2	SW -2.5				805				2	X		X												X	X		
3	SW -2.5 MS/MSD				805				4	X		X												X	X		
4	SW -2				825				2	X		X												X	X		
5	SW -1.5				832				2	X		X												X	X		
6	SD -7	SL	C		930				3	X									X	X	X						
7	SD -6				940				2	X									X	X							
8	SD -5				950				3	X									X	X	X						
9	SD -3				1000				3	X									X	X	X						
10	SD -3 MS/MSD				1000				4	X									X	X							
11	SD -1				1030				3	X									X	X	X						
12	FB -1	WT	G		1030				3	X	X									X			X				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
	Laura D Sanchez	6/28/16	1400	FedEx		
	FedEx	6/29/16	830	J.Z PACE	6/29/16	830

SAMPLE CONDITIONS

TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
1.1	Y	Y	Y
1.7			

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Laura Sanchez for Gary Gann (G.G.)

SIGNATURE of SAMPLER: Laura D Sanchez

DATE Signed: 6/28/16

Pace Analytical

1000 Riverbend. Blvd., Suite F
St. Rose, LA 70087

Sample Condition Upon

WO#: 2038933

PM: MM1 **Due Date: 07/21/16**
CLIENT: 20-EarthConJ

Project #: [illegible]

Courier: ☐ Pace Courier ☐ Hired Courier ☒ Fed X ☐ UPS ☐ DHL ☐ USPS ☐ Customer ☐ Other

Custody Seal on Cooler/Box Present: [see COC] **Custody Seals intact:** ☒Yes ☐No

Therometer Used: ☐ Therm Fisher IR 5 ☐ Therm Fisher IR 6 ☒ Therm Fisher IR 7

Type of Ice: (Wet) Blue None

Samples on ice: [see COC]

Cooler Temperature: [see COC]

Temp should be above freezing to 6°C

Date and Initials of person examining contents: Oct-28-16 MB

Temp must be measured from Temperature blank when present

				Comments:
Temperature Blank Present"?	☒Yes	☐No	☒N/A	1
Chain of Custody Present:	☒Yes	☐No	☐N/A	2
Chain of Custody Complete:	☒Yes	☐No	☐N/A	3
Chain of Custody Relinquished:	☒Yes	☐No	☐N/A	4
Sampler Name & Signature on COC:	☒Yes	☐No	☐N/A	5
Samples Arrived within Hold Time:	☒Yes	☐No	☐N/A	6
Sufficient Volume:	☒Yes	☐No	☐N/A	7
Correct Containers Used:	☒Yes	☐No	☐N/A	8
Filtered vol. Rec. for Diss. tests	☐Yes	☐No	☒N/A	9
Sample Labels match COC:	☒Yes	☐No	☐N/A	10
All containers received within manafacture's precautionary and/or expiration dates.	☒Yes	☐No	☐N/A	11
All containers needing chemical preservation have been checked (except VOA, coliform, & O&G).	☒Yes	☐No	☐N/A	12
All containers preservation checked found to be in compliance with EPA recommendation.	☒Yes	☐No	☐N/A	13 If No, was preserative added? ☐Yes ☐No If added record lot no.: HNO3 _____ H2SO4 _____
Headspace in VOA Vials (>6mm):	☐Yes	☐No	☒N/A	14
Trip Blank Present:	☐Yes	☒No		15

Client Notification/ Resolution:

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

4013463 4

Chain of Custody

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40134639

MV

Workorder: 2038933 **Workorder Name:** IP Wiggins-CHB **Owner Received Date:** 6/29/2016 **Results Requested By:** 7/21/2016

Report To	Subcontract To
Melissa MacNaughton Pace Analytical New Orleans 1000 Riverbend Blvd Suite F St. Rose, LA 70087 Phone (504)469-0333	Pace Analytical Green Bay 1241 Bellevue Street Suite 9 Green Bay, WI 54302 Phone (920)469-2436

Item	Sample ID	Sample Type	Collect Date/Time	Lab ID	Matrix	Preserved Containers: Unpreserved	4oz					Requested Analysis: 9060 TOC												LAB USE ONLY
1	SD-7 001	PS	6/28/2016 09:30	2038933005	Solid	1						X												1-4ozCGJA
2	SD-6 002	PS	6/28/2016 09:40	2038933006	Solid	1						X												
3	SD-5 003	PS	6/28/2016 09:50	2038933007	Solid	1						X												
4	SD-3 004	RQS	6/28/2016 10:00	2038933008	Solid	3						X												3-4ozCGA
5	SD-1 005	PS	6/28/2016 10:30	2038933009	Solid	1						X												

BH 6/30/16

Transfers	Released By	Date/Time	Received By	Date/Time
1	Fed Ex	6/30/16 1005	pace	6/30/16 1005
2				
3				

Comments

Cooler Temperature on Receipt 3 °C | **Custody Seal** (Y) or N | **Received on Ice** (Y) or N | **Samples Intact** (Y) or N

****In order to maintain client confidentiality, location/name of the sampling site, sampler's name and signature may not be provided on this COC document. This chain of custody is considered complete as is since this information is available in the owner laboratory.*

11 of 79

40134639

Pace Analytical Services, Inc.
1700 Elm Street
Minneapolis, MN 55414
Phone: 612.607.1700
Fax: 612.607.6444

www.pacelabs.com

Report Prepared for:

Melissa MacNaughton
PACE New Orleans
1000 Riverbend Blvd.
Suite F
Saint Rose LA 70087

REPORT OF LABORATORY ANALYSIS FOR PCDD/PCDF

Report Information:

Pace Project #: 10354383
Sample Receipt Date: 06/30/2016
Client Project #: 2038933
Client Sub PO #: N/A
State Cert #: MN00064

Invoicing & Reporting Options:

The report provided has been invoiced as a Level 2 PCDD/PCDF Report. If an upgrade of this report package is requested, an additional charge may be applied.

Please review the attached invoice for accuracy and forward any questions to Scott Unze, your Pace Project Manager.

This report has been reviewed by:

July 18, 2016
Nathan Boberg, Project Manager

(612) 607-6444 (fax)
nathan.boberg@pacelabs.com

Report Prepared Date:
July 15, 2016

Report of Laboratory Analysis

Pace Analytical Services, Inc.
1700 Elm Street
Minneapolis, MN 55414
Phone: 612.607.1700
Fax: 612.607.6444

DISCUSSION

This report presents the results from the analyses performed on six samples submitted by a representative of Pace Analytical Services, Inc. The samples were analyzed for the presence or absence of polychlorodibenzo-p-dioxins (PCDDs) and polychlorodibenzofurans (PCDFs) using a modified version of USEPA Method 8290. The reporting limits were set to correspond to the lowest calibration points and were adjusted for sample amount and/or dilution. Estimated Maximum Possible Concentration (EMPC) values were treated as positives in the toxic equivalence calculations.

Second column confirmation analyses of 2,3,7,8-TCDF values obtained from the primary (DB5-MS) column are performed only when specifically requested for a project and only when the values are above the concentration of the lowest calibration standard. Typical resolution for this isomer using the DB5-MS column ranges from 25-30%.

The recoveries of the isotopically-labeled PCDD/PCDF internal standards in the sample extracts ranged from 51-120%. Except for one elevated value, which was flagged "R" on the results table, the labeled standard recoveries obtained for this project were within the 40-135% target range specified in Method 8290. Also, since the quantification of the native 2,3,7,8-substituted congeners was based on isotope dilution, the data were automatically corrected for variation in recovery and accurate values were obtained.

In some cases, interfering substances impacted the determinations of PCDF congeners; the affected values were flagged "P" where polychlorinated diphenyl ethers were present. Concentrations above the calibration range were flagged "E" and should be regarded as estimates. Values obtained from analyses of diluted extracts were flagged "D". Values obtained from separate analyses of the sample extracts were flagged "N2".

A laboratory method blank was prepared and analyzed with each sample batch as part of our routine quality control procedures. The results show the blanks to be free of PCDDs and PCDFs at the reporting limits. These results indicate that the processing steps did not significantly impact the results reported for the field samples.

Laboratory and matrix spike samples were also prepared with the sample batch using clean sand, water, or sample matrix that had been fortified with native standard materials. The results show that the spiked native compounds in the laboratory spike samples were recovered at 80-125%; these results were within the target range for the method. All of the background-subtracted recovery values obtained for the matrix spike samples were outside the 70-130% target range. Also, the relative percent differences obtained for 1,2,3,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, and OCDF were above the 20% target upper limit. These deviations may be attributable to the levels of the target compounds in the sample material and/or sample inhomogeneity.

The responses obtained for the labeled HpCDD and/or OCDD in calibration standard analyses U160710B_18 and U160714B_17 were outside the target ranges. As specified in our procedures, the averages of the daily response factors for these compounds were used in the calculations for the samples from these runshifts. The affected values were flagged "Y" on the results tables. It should be noted thaat the accuracy of the native congener determinations was not impacted by these deviations.

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Minnesota Laboratory Certifications

Authority	Certificate #	Authority	Certificate #
A2LA	2926.01	Mississippi	MN00064
Alabama	40770	Montana	92
Alaska	MN00064	Nebraska	NE-OS-18-06
Arizona	AZ0014	Nevada	MN_00064_200
Arkansas	88-0680	New Jersey (NE	MN002
California	01155CA	New York (NEL	11647
Colorado	MN00064	North Carolina	27700
Connecticut	PH-0256	North Dakota	R-036
EPA Region 8	8TMS-Q	Ohio	4150
Florida (NELAP	E87605	Oklahoma	D9922
Georgia (DNR)	959	Oregon (ELAP)	MN200001-005
Guam	959	Oregon (OREL	MN300001-001
Hawaii	SLD	Pennsylvania	68-00563
Idaho	MN00064	Puerto Rico	MN00064
Illinois	200012	Saipan	MP0003
Indiana	C-MN-01	South Carolina	74003001
Indiana	C-MN-01	Tennessee	TN02818
Iowa	368	Texas	T104704192-08
Kansas	E-10167	Utah (NELAP)	MN00064
Kentucky	90062	Virginia	00251
Louisiana	03086	Washington	C755
Maine	2007029	West Virginia #	9952C
Maryland	322	West Virginia D	382
Michigan	9909	Wisconsin	999407970
Minnesota	027-053-137	Wyoming	8TMS-Q

REPORT OF LABORATORY ANALYSIS

Appendix A

Sample Management

Chain of Custody

Pace Analytical®
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10354383

Workorder: 2038933 **Workorder Name:** IP Wiggins-CHB **Owner Received Date:** 6/29/2016 **Results Requested By:** 7/21/2016

Report To	Subcontract To
Melissa MacNaughton Pace Analytical New Orleans 1000 Riverbend Blvd Suite F St. Rose, LA 70087 Phone (504)469-0333	Pace Analytical Minneapolis 1700 Elm Street SE Minneapolis, MN 55414 Phone (612)607-1700

Item	Sample ID	Sample Type	Collect Date/Time	Lab ID	Matrix	Preserved Containers: Unpreserved	4oz	Agiz				Requested Analysis: 8290	dioxin / furans											LAB USE ONLY
1	SD-7	PS	6/28/2016 09:30	2038933005	Solid	1	X					X												001
2	SD-6	PS	6/28/2016 09:40	2038933006	Solid	1	X					X												002
3	SD-5	PS	6/28/2016 09:50	2038933007	Solid	1	X					X												003
4	SD-3	RQS	6/28/2016 10:00	2038933008	Solid	1	X					X												004
5	SD-1	PS	6/28/2016 10:30	2038933009	Solid	1	X					X												005
6	FB-1	PS	6/28/2016 10:30	2038933010	Water	2		X				X												006

Transfers	Released By	Date/Time	Received By	Date/Time
1	[signature] PACE	6/29/16 1700	FedEx	6/29/16 1700
2	[signature]		[signature]	6/30/16 1015
3				

Comments

Cooler Temperature on Receipt 3.6 °C | Custody Seal Y or (N) | Received on Ice (Y) or N | Samples Intact (Y) or N

****In order to maintain client confidentiality, location/name of the sampling site, sampler's name and signature may not be provided on this COC document.*
This chain of custody is considered complete as is since this information is available in the owner laboratory.

Pace Analytical	Document Name: Sample Condition Upon Receipt Form	Document Revised: 04Apr2016 Page 1 of 1
	Document No.: F-MN-L-213-rev.16	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: Pace New Orleans

Project #: WO#: 10354383

10354383

Courier: ☑ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace ☐ SpeeDee ☐ Other:

Tracking Number: 6344 4050 4903

Custody Seal on Cooler/Box Present? ☐ Yes ☑ No **Seals Intact?** ☐ Yes ☑ No **Optional:** Proj. Due Date: Proj. Name:

Packing Material: ☑ Bubble Wrap ☑ Bubble Bags ☐ None ☐ Other: **Temp Blank?** ☑ Yes ☐ No

Thermometer Used: ☐ 151401163 ☐ 151401164 ☑ B88A912167504 ☐ B88A0143310098 **Type of Ice:** ☑ Wet ☐ Blue ☐ None ☐ Samples on ice, cooling process has begun

Cooler Temp Read (°C): 3.6 **Cooler Temp Corrected (°C):** 3.6 **Biological Tissue Frozen?** ☐ Yes ☐ No ☑ N/A

Temp should be above freezing to 6°C **Correction Factor:** +0.0 **Date and Initials of Person Examining Contents:** GS 6/30/16

USDA Regulated Soil (☐ N/A, water sample)

Did samples originate in a quarantine zone within the United States: AL, AR, AZ, CA, FL, GA, ID, LA, MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? ☑ Yes ☐ No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐ Yes ☑ No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

				COMMENTS:
Chain of Custody Present?	☑ Yes	☐ No	☐ N/A	1.
Chain of Custody Filled Out?	☑ Yes	☐ No	☐ N/A	2.
Chain of Custody Relinquished?	☑ Yes	☐ No	☐ N/A	3.
Sampler Name and/or Signature on COC?	☐ Yes	☑ No	☐ N/A	4.
Samples Arrived within Hold Time?	☑ Yes	☐ No	☐ N/A	5.
Short Hold Time Analysis (<72 hr)?	☐ Yes	☑ No	☐ N/A	6.
Rush Turn Around Time Requested?	☐ Yes	☑ No	☐ N/A	7.
Sufficient Volume?	☑ Yes	☐ No	☐ N/A	8.
Correct Containers Used?	☑ Yes	☐ No	☐ N/A	9.
-Pace Containers Used?	☑ Yes	☐ No	☐ N/A	
Containers Intact?	☑ Yes	☐ No	☐ N/A	10.
Filtered Volume Received for Dissolved Tests?	☐ Yes	☐ No	☑ N/A	11. Note if sediment is visible in the dissolved container
Sample Labels Match COC? -Includes Date/Time/ID/Analysis Matrix: WT/SL	☑ Yes	☐ No	☐ N/A	12.
All containers needing acid/base preservation have been checked?	☐ Yes	☐ No	☑ N/A	13. ☐ HNO_3 ☐ H_2SO_4 ☐ NaOH ☐ HCl Sample #
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, HCl<2; NaOH >9 Sulfide, NaOH>12 Cyanide)	☐ Yes	☐ No	☑ N/A	
Exceptions: VOA, Coliform, TOC, Oil and Grease, DRO/8015 (water) DOC	☐ Yes	☐ No	☑ N/A	Initial when completed: Lot # of added preservative:
Headspace in VOA Vials (>6mm)?	☐ Yes	☐ No	☑ N/A	14.
Trip Blank Present?	☐ Yes	☑ No	☐ N/A	15.
Trip Blank Custody Seals Present?	☐ Yes	☐ No	☑ N/A	
Pace Trip Blank Lot # (if purchased):				

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐ Yes ☐ No

Person Contacted: Date/Time:

Comments/Resolution:

Project Manager Review: Date: 07/05/16

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers).

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Reporting Flags

A = Reporting Limit based on signal to noise

B = Less than 10x higher than method blank level

C = Result obtained from confirmation analysis

D = Result obtained from analysis of diluted sample

E = Exceeds calibration range

I = Interference present

J = Estimated value

Nn = Value obtained from additional analysis

P = PCDE Interference

R = Recovery outside target range

S = Peak saturated

U = Analyte not detected

V = Result verified by confirmation analysis

X = %D Exceeds limits

Y = Calculated using average of daily RFs

* = See Discussion

Appendix B

Sample Analysis Summary

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Sample Analysis Results

Client - PACE New Orleans

Client's Sample ID	SD-7		
Lab Sample ID	2038933005		
Filename	F160713A_11		
Injected By	CVS		
Total Amount Extracted	14.4 g	Matrix	Solid
% Moisture	30.3	Dilution	5
Dry Weight Extracted	10.0 g	Collected	06/28/2016 09:30
ICAL ID	F160602	Received	06/30/2016 10:15
CCal Filename(s)	F160713A_01 & F160713A_17	Extracted	07/06/2016 17:50
Method Blank ID	BLANK-50948	Analyzed	07/13/2016 06:34

Native Isomers	Conc ng/Kg	EMPC ng/Kg	RL ng/Kg		Internal Standards	ng's Added	Percent Recovery	
2,3,7,8-TCDF	6.8	-----	5.0	D	2,3,7,8-TCDF-13C	2.00	74	D
Total TCDF	630.0	-----	5.0	D	2,3,7,8-TCDD-13C	2.00	84	D
					1,2,3,7,8-PeCDF-13C	2.00	74	D
2,3,7,8-TCDD	10.0	-----	5.0	D	2,3,4,7,8-PeCDF-13C	2.00	73	D
Total TCDD	800.0	-----	5.0	D	1,2,3,7,8-PeCDD-13C	2.00	79	D
					1,2,3,4,7,8-HxCDF-13C	2.00	73	D
1,2,3,7,8-PeCDF	ND	-----	25.0	D	1,2,3,6,7,8-HxCDF-13C	2.00	74	D
2,3,4,7,8-PeCDF	84.0	-----	25.0	D	2,3,4,6,7,8-HxCDF-13C	2.00	79	D
Total PeCDF	2700.0	-----	25.0	D	1,2,3,7,8,9-HxCDF-13C	2.00	77	D
					1,2,3,4,7,8-HxCDD-13C	2.00	74	D
1,2,3,7,8-PeCDD	89.0	-----	25.0	D	1,2,3,6,7,8-HxCDD-13C	2.00	67	D
Total PeCDD	2000.0	-----	25.0	D	1,2,3,4,6,7,8-HpCDF-13C	2.00	77	DN2
					1,2,3,4,7,8,9-HpCDF-13C	2.00	93	DN2
1,2,3,4,7,8-HxCDF	280.0	-----	25.0	D	1,2,3,4,6,7,8-HpCDD-13C	2.00	93	YDN2
1,2,3,6,7,8-HxCDF	-----	250	25.0	PD	OCDD-13C	4.00	90	YDN2
2,3,4,6,7,8-HxCDF	390.0	-----	25.0	D				
1,2,3,7,8,9-HxCDF	77.0	-----	25.0	D	1,2,3,4-TCDD-13C	2.00	NA	
Total HxCDF	10000.0	-----	25.0	D	1,2,3,7,8,9-HxCDD-13C	2.00	NA	
1,2,3,4,7,8-HxCDD	300.0	-----	25.0	D	2,3,7,8-TCDD-37Cl4	0.20	85	D
1,2,3,6,7,8-HxCDD	1300.0	-----	25.0	D				
1,2,3,7,8,9-HxCDD	720.0	-----	25.0	D				
Total HxCDD	9900.0	-----	25.0	D				
1,2,3,4,6,7,8-HpCDF	8100.0	-----	250.0	DN2	Total 2,3,7,8-TCDD			
1,2,3,4,7,8,9-HpCDF	1000.0	-----	250.0	DN2	Equivalence: 1400 ng/Kg			
Total HpCDF	33000.0	-----	250.0	DN2	(Using ITE Factors)			
1,2,3,4,6,7,8-HpCDD	45000.0	-----	250.0	DN2				
Total HpCDD	72000.0	-----	250.0	DN2				
OCDF	34000.0	-----	500.0	DN2				
OCDD	390000.0	-----	500.0	EDN2				

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
RL = Reporting Limit

ND = Not Detected
NA = Not Applicable
NC = Not Calculated

Results reported on a dry weight basis and are valid to no more than 2 significant figures.
P = PCDE Interference
E = Exceeds calibration range
D = Result obtained from analysis of diluted sample
Nn = Value obtained from additional analysis
Y = Calculated using average of daily RFs

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Sample Analysis Results

Client - PACE New Orleans

Client's Sample ID	SD-6		
Lab Sample ID	2038933006		
Filename	F160713A_10		
Injected By	CVS		
Total Amount Extracted	26.9 g	Matrix	Solid
% Moisture	62.8	Dilution	5
Dry Weight Extracted	10.0 g	Collected	06/28/2016 09:40
ICAL ID	F160602	Received	06/30/2016 10:15
CCal Filename(s)	F160713A_01 & F160713A_17	Extracted	07/06/2016 17:50
Method Blank ID	BLANK-50948	Analyzed	07/13/2016 05:49

Native Isomers	Conc ng/Kg	EMPC ng/Kg	RL ng/Kg		Internal Standards	ng's Added	Percent Recovery	
2,3,7,8-TCDF	14	-----	5.0	D	2,3,7,8-TCDF-13C	2.00	74	D
Total TCDF	730	-----	5.0	D	2,3,7,8-TCDD-13C	2.00	82	D
					1,2,3,7,8-PeCDF-13C	2.00	78	D
2,3,7,8-TCDD	14	-----	5.0	D	2,3,4,7,8-PeCDF-13C	2.00	74	D
Total TCDD	440	-----	5.0	D	1,2,3,7,8-PeCDD-13C	2.00	81	D
					1,2,3,4,7,8-HxCDF-13C	2.00	76	D
1,2,3,7,8-PeCDF	70	-----	25.0	D	1,2,3,6,7,8-HxCDF-13C	2.00	81	D
2,3,4,7,8-PeCDF	180	-----	25.0	D	2,3,4,6,7,8-HxCDF-13C	2.00	85	D
Total PeCDF	4600	-----	25.0	D	1,2,3,7,8,9-HxCDF-13C	2.00	82	D
					1,2,3,4,7,8-HxCDD-13C	2.00	79	D
1,2,3,7,8-PeCDD	220	-----	25.0	D	1,2,3,6,7,8-HxCDD-13C	2.00	70	D
Total PeCDD	2100	-----	25.0	D	1,2,3,4,6,7,8-HpCDF-13C	2.00	86	DN2
					1,2,3,4,7,8,9-HpCDF-13C	2.00	101	DN2
1,2,3,4,7,8-HxCDF	600	-----	25.0	D	1,2,3,4,6,7,8-HpCDD-13C	2.00	100	YDN2
1,2,3,6,7,8-HxCDF	-----	470	25.0	PD	OCDD-13C	4.00	101	YDN2
2,3,4,6,7,8-HxCDF	850	-----	25.0	D				
1,2,3,7,8,9-HxCDF	210	-----	25.0	D	1,2,3,4-TCDD-13C	2.00	NA	
Total HxCDF	19000	-----	25.0	D	1,2,3,7,8,9-HxCDD-13C	2.00	NA	
1,2,3,4,7,8-HxCDD	660	-----	25.0	D	2,3,7,8-TCDD-37Cl4	0.20	85	D
1,2,3,6,7,8-HxCDD	3400	-----	25.0	D				
1,2,3,7,8,9-HxCDD	1600	-----	25.0	D				
Total HxCDD	18000	-----	25.0	D				
1,2,3,4,6,7,8-HpCDF	16000	-----	400.0	DN2	Total 2,3,7,8-TCDD			
1,2,3,4,7,8,9-HpCDF	1800	-----	400.0	DN2	Equivalence: 3000 ng/Kg			
Total HpCDF	55000	-----	400.0	DN2	(Using ITE Factors)			
1,2,3,4,6,7,8-HpCDD	88000	-----	400.0	DN2				
Total HpCDD	150000	-----	400.0	DN2				
OCDF	53000	-----	800.0	DN2				
OCDD	870000	-----	800.0	EDN2				

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
RL = Reporting Limit

ND = Not Detected
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NC = Not Calculated

Results reported on a dry weight basis and are valid to no more than 2 significant figures.
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E = Exceeds calibration range
D = Result obtained from analysis of diluted sample
Nn = Value obtained from additional analysis
Y = Calculated using average of daily RFs

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Sample Analysis Results

Client - PACE New Orleans

Client's Sample ID	SD-5		
Lab Sample ID	2038933007		
Filename	F160713A_09		
Injected By	CVS		
Total Amount Extracted	25.4 g	Matrix	Solid
% Moisture	60.5	Dilution	5
Dry Weight Extracted	10.0 g	Collected	06/28/2016 09:50
ICAL ID	F160602	Received	06/30/2016 10:15
CCal Filename(s)	F160713A_01 & F160713A_17	Extracted	07/06/2016 17:50
Method Blank ID	BLANK-50948	Analyzed	07/13/2016 05:04

Native Isomers	Conc ng/Kg	EMPC ng/Kg	RL ng/Kg		Internal Standards	ng's Added	Percent Recovery	
2,3,7,8-TCDF	15	-----	5.0	D	2,3,7,8-TCDF-13C	2.00	75	D
Total TCDF	670	-----	5.0	D	2,3,7,8-TCDD-13C	2.00	83	D
					1,2,3,7,8-PeCDF-13C	2.00	79	D
2,3,7,8-TCDD	13	-----	5.0	D	2,3,4,7,8-PeCDF-13C	2.00	92	D
Total TCDD	440	-----	5.0	D	1,2,3,7,8-PeCDD-13C	2.00	87	D
					1,2,3,4,7,8-HxCDF-13C	2.00	75	D
1,2,3,7,8-PeCDF	68	-----	25.0	D	1,2,3,6,7,8-HxCDF-13C	2.00	77	D
2,3,4,7,8-PeCDF	180	-----	25.0	D	2,3,4,6,7,8-HxCDF-13C	2.00	81	D
Total PeCDF	3800	-----	25.0	D	1,2,3,7,8,9-HxCDF-13C	2.00	80	D
					1,2,3,4,7,8-HxCDD-13C	2.00	76	D
1,2,3,7,8-PeCDD	200	-----	25.0	D	1,2,3,6,7,8-HxCDD-13C	2.00	68	D
Total PeCDD	1900	-----	25.0	D	1,2,3,4,6,7,8-HpCDF-13C	2.00	88	DN2
					1,2,3,4,7,8,9-HpCDF-13C	2.00	109	DN2
1,2,3,4,7,8-HxCDF	530	-----	25.0	D	1,2,3,4,6,7,8-HpCDD-13C	2.00	98	YDN2
1,2,3,6,7,8-HxCDF	-----	440	25.0	PD	OCDD-13C	4.00	111	YDN2
2,3,4,6,7,8-HxCDF	730	-----	25.0	D				
1,2,3,7,8,9-HxCDF	190	-----	25.0	D	1,2,3,4-TCDD-13C	2.00	NA	
Total HxCDF	17000	-----	25.0	D	1,2,3,7,8,9-HxCDD-13C	2.00	NA	
1,2,3,4,7,8-HxCDD	600	-----	25.0	D	2,3,7,8-TCDD-37Cl4	0.20	82	D
1,2,3,6,7,8-HxCDD	3300	-----	25.0	D				
1,2,3,7,8,9-HxCDD	1500	-----	25.0	D				
Total HxCDD	17000	-----	25.0	D				
1,2,3,4,6,7,8-HpCDF	14000	-----	300.0	DN2	Total 2,3,7,8-TCDD			
1,2,3,4,7,8,9-HpCDF	1400	-----	300.0	DN2	Equivalence: 2900 ng/Kg			
Total HpCDF	49000	-----	300.0	DN2	(Using ITE Factors)			
1,2,3,4,6,7,8-HpCDD	94000	-----	300.0	DN2				
Total HpCDD	160000	-----	300.0	DN2				
OCDF	46000	-----	600.0	DN2				
OCDD	800000	-----	600.0	EDN2				

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
RL = Reporting Limit

ND = Not Detected
NA = Not Applicable
NC = Not Calculated

Results reported on a dry weight basis and are valid to no more than 2 significant figures.
P = PCDE Interference
E = Exceeds calibration range
D = Result obtained from analysis of diluted sample
Nn = Value obtained from additional analysis
Y = Calculated using average of daily RFs

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Sample Analysis Results

Client - PACE New Orleans

Client's Sample ID	SD-3		
Lab Sample ID	2038933008		
Filename	F160713A_08		
Injected By	CVS		
Total Amount Extracted	18.4 g	Matrix	Solid
% Moisture	23.7	Dilution	5
Dry Weight Extracted	14.0 g	Collected	06/28/2016 10:00
ICAL ID	F160602	Received	06/30/2016 10:15
CCal Filename(s)	F160713A_01 & F160713A_17	Extracted	07/06/2016 17:50
Method Blank ID	BLANK-50948	Analyzed	07/13/2016 04:20

Native Isomers	**Conc** ng/Kg	**EMPC** ng/Kg	**RL** ng/Kg		**Internal Standards**	**ng's Added**	**Percent Recovery**	
2,3,7,8-TCDF	82	-----	3.6	D	2,3,7,8-TCDF-13C	2.00	78	D
Total TCDF	3200	-----	3.6	D	2,3,7,8-TCDD-13C	2.00	85	D
					1,2,3,7,8-PeCDF-13C	2.00	83	D
2,3,7,8-TCDD	47	-----	3.6	D	2,3,4,7,8-PeCDF-13C	2.00	80	D
Total TCDD	6500	-----	3.6	ED	1,2,3,7,8-PeCDD-13C	2.00	88	D
					1,2,3,4,7,8-HxCDF-13C	2.00	77	D
1,2,3,7,8-PeCDF	-----	150	18.0	PD	1,2,3,6,7,8-HxCDF-13C	2.00	79	D
2,3,4,7,8-PeCDF	810	-----	18.0	D	2,3,4,6,7,8-HxCDF-13C	2.00	78	D
Total PeCDF	15000	-----	18.0	D	1,2,3,7,8,9-HxCDF-13C	2.00	80	D
					1,2,3,4,7,8-HxCDD-13C	2.00	75	D
1,2,3,7,8-PeCDD	270	-----	18.0	D	1,2,3,6,7,8-HxCDD-13C	2.00	75	D
Total PeCDD	17000	-----	18.0	ED	1,2,3,4,6,7,8-HpCDF-13C	2.00	98	DN2
					1,2,3,4,7,8,9-HpCDF-13C	2.00	120	DN2
1,2,3,4,7,8-HxCDF	1200	-----	18.0	D	1,2,3,4,6,7,8-HpCDD-13C	2.00	97	YDN2
1,2,3,6,7,8-HxCDF	740	-----	18.0	D	OCDD-13C	4.00	51	YDN2
2,3,4,6,7,8-HxCDF	1400	-----	18.0	D				
1,2,3,7,8,9-HxCDF	640	-----	18.0	D	1,2,3,4-TCDD-13C	2.00	NA	
Total HxCDF	47000	-----	360.0	DN2	1,2,3,7,8,9-HxCDD-13C	2.00	NA	
1,2,3,4,7,8-HxCDD	1300	-----	18.0	D	2,3,7,8-TCDD-37Cl4	0.20	91	D
1,2,3,6,7,8-HxCDD	9800	-----	18.0	ED				
1,2,3,7,8,9-HxCDD	2600	-----	18.0	D				
Total HxCDD	62000	-----	18.0	ED				
1,2,3,4,6,7,8-HpCDF	22000	-----	360.0	DN2	Total 2,3,7,8-TCDD			
1,2,3,4,7,8,9-HpCDF	2200	-----	360.0	DN2	Equivalence: 7300 ng/Kg			
Total HpCDF	85000	-----	360.0	DN2	(Using ITE Factors)			
1,2,3,4,6,7,8-HpCDD	240000	-----	360.0	EDN2				
Total HpCDD	370000	-----	360.0	EDN2				
OCDF	150000	-----	710.0	DN2				
OCDD	2200000	-----	710.0	EDN2				

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
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Results reported on a dry weight basis and are valid to no more than 2 significant figures.
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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Sample Analysis Results

Client - PACE New Orleans

Client's Sample ID	SD-1		
Lab Sample ID	2038933009		
Filename	F160711A_10		
Injected By	BAL		
Total Amount Extracted	12.6 g	Matrix	Solid
% Moisture	20.3	Dilution	NA
Dry Weight Extracted	10.0 g	Collected	06/28/2016 10:30
ICAL ID	F160602	Received	06/30/2016 10:15
CCal Filename(s)	F160711A_01 & F160711A_18	Extracted	07/06/2016 17:50
Method Blank ID	BLANK-50948	Analyzed	07/11/2016 09:07

Native Isomers	**Conc** ng/Kg	**EMPC** ng/Kg	**RL** ng/Kg	**Internal Standards**	**ng's Added**	**Percent Recovery**
2,3,7,8-TCDF	ND	-----	1.00	2,3,7,8-TCDF-13C	2.00	79
Total TCDF	ND	-----	1.00	2,3,7,8-TCDD-13C	2.00	90
				1,2,3,7,8-PeCDF-13C	2.00	80
2,3,7,8-TCDD	ND	-----	1.00	2,3,4,7,8-PeCDF-13C	2.00	94
Total TCDD	ND	-----	1.00	1,2,3,7,8-PeCDD-13C	2.00	91
				1,2,3,4,7,8-HxCDF-13C	2.00	77
1,2,3,7,8-PeCDF	ND	-----	5.00	1,2,3,6,7,8-HxCDF-13C	2.00	79
2,3,4,7,8-PeCDF	ND	-----	5.00	2,3,4,6,7,8-HxCDF-13C	2.00	80
Total PeCDF	ND	-----	5.00	1,2,3,7,8,9-HxCDF-13C	2.00	74
				1,2,3,4,7,8-HxCDD-13C	2.00	75
1,2,3,7,8-PeCDD	ND	-----	5.00	1,2,3,6,7,8-HxCDD-13C	2.00	66
Total PeCDD	ND	-----	5.00	1,2,3,4,6,7,8-HpCDF-13C	2.00	71
				1,2,3,4,7,8,9-HpCDF-13C	2.00	80
1,2,3,4,7,8-HxCDF	ND	-----	5.00	1,2,3,4,6,7,8-HpCDD-13C	2.00	88
1,2,3,6,7,8-HxCDF	ND	-----	5.00	OCDD-13C	4.00	79
2,3,4,6,7,8-HxCDF	ND	-----	5.00			
1,2,3,7,8,9-HxCDF	ND	-----	5.00	1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	ND	-----	5.00	1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	ND	-----	5.00	2,3,7,8-TCDD-37Cl4	0.20	92
1,2,3,6,7,8-HxCDD	ND	-----	5.00			
1,2,3,7,8,9-HxCDD	ND	-----	5.00			
Total HxCDD	ND	-----	5.00			
1,2,3,4,6,7,8-HpCDF	ND	-----	5.00	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	ND	-----	5.00	Equivalence: 0.21 ng/Kg		
Total HpCDF	ND	-----	5.00	(Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	8.2	-----	5.00			
Total HpCDD	16.0	-----	5.00			
OCDF	ND	-----	10.00			
OCDD	130.0	-----	10.00			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
RL = Reporting Limit

ND = Not Detected
NA = Not Applicable
NC = Not Calculated

Results reported on a dry weight basis and are valid to no more than 2 significant figures.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Sample Analysis Results

Client - PACE New Orleans

Client's Sample ID	FB-1		
Lab Sample ID	2038933010		
Filename	U160714B_04		
Injected By	BAL		
Total Amount Extracted	978 mL	Matrix	Water
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	06/28/2016 10:30
ICAL ID	U160204	Received	06/30/2016 10:15
CCal Filename(s)	U160714B_01 & U160714B_17	Extracted	07/08/2016 11:40
Method Blank ID	BLANK-50978	Analyzed	07/14/2016 15:18

Native Isomers	Conc pg/L	EMPC pg/L	RL pg/L	Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	ND	-----	10	2,3,7,8-TCDF-13C	2.00	76
Total TCDF	ND	-----	10	2,3,7,8-TCDD-13C	2.00	98
				1,2,3,7,8-PeCDF-13C	2.00	73
2,3,7,8-TCDD	ND	-----	10	2,3,4,7,8-PeCDF-13C	2.00	70
Total TCDD	ND	-----	10	1,2,3,7,8-PeCDD-13C	2.00	90
				1,2,3,4,7,8-HxCDF-13C	2.00	73
1,2,3,7,8-PeCDF	ND	-----	51	1,2,3,6,7,8-HxCDF-13C	2.00	74
2,3,4,7,8-PeCDF	ND	-----	51	2,3,4,6,7,8-HxCDF-13C	2.00	80
Total PeCDF	ND	-----	51	1,2,3,7,8,9-HxCDF-13C	2.00	82
				1,2,3,4,7,8-HxCDD-13C	2.00	90
1,2,3,7,8-PeCDD	ND	-----	51	1,2,3,6,7,8-HxCDD-13C	2.00	79
Total PeCDD	ND	-----	51	1,2,3,4,6,7,8-HpCDF-13C	2.00	93
				1,2,3,4,7,8,9-HpCDF-13C	2.00	99
1,2,3,4,7,8-HxCDF	ND	-----	51	1,2,3,4,6,7,8-HpCDD-13C	2.00	88 Y
1,2,3,6,7,8-HxCDF	ND	-----	51	OCDD-13C	4.00	75 Y
2,3,4,6,7,8-HxCDF	ND	-----	51			
1,2,3,7,8,9-HxCDF	ND	-----	51	1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	ND	-----	51	1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	ND	-----	51	2,3,7,8-TCDD-37Cl4	0.20	97
1,2,3,6,7,8-HxCDD	ND	-----	51			
1,2,3,7,8,9-HxCDD	ND	-----	51			
Total HxCDD	ND	-----	51			
1,2,3,4,6,7,8-HpCDF	ND	-----	51	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	ND	-----	51	Equivalence: 0.00 pg/L		
Total HpCDF	ND	-----	51	(Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	ND	-----	51			
Total HpCDD	ND	-----	51			
OCDF	ND	-----	100			
OCDD	ND	-----	100			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
RL = Reporting Limit

ND = Not Detected
NA = Not Applicable
NC = Not Calculated

Y = Calculated using average of daily RFs

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Blank Analysis Results

Lab Sample ID	BLANK-50948	Matrix	Solid
Filename	F160710B_11	Dilution	NA
Total Amount Extracted	20.4 g	Extracted	07/06/2016 17:50
ICAL ID	F160602	Analyzed	07/10/2016 18:57
CCal Filename(s)	F160710B_03 & F160710B_20	Injected By	BAL

Native Isomers	Conc ng/Kg	EMPC ng/Kg	RL ng/Kg	Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	ND	-----	0.49	2,3,7,8-TCDF-13C	2.00	79
Total TCDF	ND	-----	0.49	2,3,7,8-TCDD-13C	2.00	90
				1,2,3,7,8-PeCDF-13C	2.00	79
2,3,7,8-TCDD	ND	-----	0.49	2,3,4,7,8-PeCDF-13C	2.00	77
Total TCDD	ND	-----	0.49	1,2,3,7,8-PeCDD-13C	2.00	83
				1,2,3,4,7,8-HxCDF-13C	2.00	84
1,2,3,7,8-PeCDF	ND	-----	2.50	1,2,3,6,7,8-HxCDF-13C	2.00	86
2,3,4,7,8-PeCDF	ND	-----	2.50	2,3,4,6,7,8-HxCDF-13C	2.00	87
Total PeCDF	ND	-----	2.50	1,2,3,7,8,9-HxCDF-13C	2.00	78
				1,2,3,4,7,8-HxCDD-13C	2.00	86
1,2,3,7,8-PeCDD	ND	-----	2.50	1,2,3,6,7,8-HxCDD-13C	2.00	71
Total PeCDD	ND	-----	2.50	1,2,3,4,6,7,8-HpCDF-13C	2.00	84
				1,2,3,4,7,8,9-HpCDF-13C	2.00	83
1,2,3,4,7,8-HxCDF	ND	-----	2.50	1,2,3,4,6,7,8-HpCDD-13C	2.00	96
1,2,3,6,7,8-HxCDF	ND	-----	2.50	OCDD-13C	4.00	81
2,3,4,6,7,8-HxCDF	ND	-----	2.50			
1,2,3,7,8,9-HxCDF	ND	-----	2.50	1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	ND	-----	2.50	1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	ND	-----	2.50	2,3,7,8-TCDD-37Cl4	0.20	88
1,2,3,6,7,8-HxCDD	ND	-----	2.50			
1,2,3,7,8,9-HxCDD	ND	-----	2.50			
Total HxCDD	ND	-----	2.50			
1,2,3,4,6,7,8-HpCDF	ND	-----	2.50	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	ND	-----	2.50	Equivalence: 0.00 ng/Kg		
Total HpCDF	ND	-----	2.50	(Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	ND	-----	2.50			
Total HpCDD	ND	-----	2.50			
OCDF	ND	-----	4.90			
OCDD	ND	-----	4.90			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
RL = Reporting Limit

Results reported on a total weight basis and are valid to no more than 2 significant figures.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Blank Analysis Results

Lab Sample ID	BLANK-50978	Matrix	Water
Filename	F160710B_12	Dilution	NA
Total Amount Extracted	1020 mL	Extracted	07/08/2016 11:40
ICAL ID	F160602	Analyzed	07/10/2016 19:41
CCal Filename(s)	F160710B_03 & F160710B_20	Injected By	BAL

Native Isomers	Conc pg/L	EMPC pg/L	RL pg/L	Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	ND	-----	9.8	2,3,7,8-TCDF-13C	2.00	83
Total TCDF	ND	-----	9.8	2,3,7,8-TCDD-13C	2.00	92
				1,2,3,7,8-PeCDF-13C	2.00	79
2,3,7,8-TCDD	ND	-----	9.8	2,3,4,7,8-PeCDF-13C	2.00	79
Total TCDD	ND	-----	9.8	1,2,3,7,8-PeCDD-13C	2.00	84
				1,2,3,4,7,8-HxCDF-13C	2.00	99
1,2,3,7,8-PeCDF	ND	-----	49.0	1,2,3,6,7,8-HxCDF-13C	2.00	99
2,3,4,7,8-PeCDF	ND	-----	49.0	2,3,4,6,7,8-HxCDF-13C	2.00	105
Total PeCDF	ND	-----	49.0	1,2,3,7,8,9-HxCDF-13C	2.00	92
				1,2,3,4,7,8-HxCDD-13C	2.00	94
1,2,3,7,8-PeCDD	ND	-----	49.0	1,2,3,6,7,8-HxCDD-13C	2.00	88
Total PeCDD	ND	-----	49.0	1,2,3,4,6,7,8-HpCDF-13C	2.00	98
				1,2,3,4,7,8,9-HpCDF-13C	2.00	96
1,2,3,4,7,8-HxCDF	ND	-----	49.0	1,2,3,4,6,7,8-HpCDD-13C	2.00	108
1,2,3,6,7,8-HxCDF	ND	-----	49.0	OCDD-13C	4.00	97
2,3,4,6,7,8-HxCDF	ND	-----	49.0			
1,2,3,7,8,9-HxCDF	ND	-----	49.0	1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	ND	-----	49.0	1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	ND	-----	49.0	2,3,7,8-TCDD-37Cl4	0.20	91
1,2,3,6,7,8-HxCDD	ND	-----	49.0			
1,2,3,7,8,9-HxCDD	ND	-----	49.0			
Total HxCDD	ND	-----	49.0			
1,2,3,4,6,7,8-HpCDF	ND	-----	49.0	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	ND	-----	49.0	Equivalence: 0.00 pg/L		
Total HpCDF	ND	-----	49.0	(Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	ND	-----	49.0			
Total HpCDD	ND	-----	49.0			
OCDF	ND	-----	98.0			
OCDD	ND	-----	98.0			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
RL = Reporting Limit

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Laboratory Control Spike Results

Lab Sample ID	LCS-50949		
Filename	U160710B_02	Matrix	Solid
Total Amount Extracted	20.0 g	Dilution	NA
ICAL ID	U160204	Extracted	07/06/2016 17:50
CCal Filename(s)	U160710B_01 & U160710B_18	Analyzed	07/10/2016 11:15
Method Blank ID	BLANK-50948	Injected By	BAL

Native Isomers	Qs (ng)	Qm (ng)	% Rec.	Internal Standards	ng's Added	Percent Recovery	
2,3,7,8-TCDF	0.20	0.22	110	2,3,7,8-TCDF-13C	2.0	64	
Total TCDF				2,3,7,8-TCDD-13C	2.0	74	
				1,2,3,7,8-PeCDF-13C	2.0	64	
2,3,7,8-TCDD	0.20	0.17	87	2,3,4,7,8-PeCDF-13C	2.0	59	
Total TCDD				1,2,3,7,8-PeCDD-13C	2.0	67	
				1,2,3,4,7,8-HxCDF-13C	2.0	59	
1,2,3,7,8-PeCDF	1.0	1.0	103	1,2,3,6,7,8-HxCDF-13C	2.0	61	
2,3,4,7,8-PeCDF	1.0	1.1	111	2,3,4,6,7,8-HxCDF-13C	2.0	63	
Total PeCDF				1,2,3,7,8,9-HxCDF-13C	2.0	67	
				1,2,3,4,7,8-HxCDD-13C	2.0	63	
1,2,3,7,8-PeCDD	1.0	0.97	97	1,2,3,6,7,8-HxCDD-13C	2.0	60	
Total PeCDD				1,2,3,4,6,7,8-HpCDF-13C	2.0	61	
				1,2,3,4,7,8,9-HpCDF-13C	2.0	68	
1,2,3,4,7,8-HxCDF	1.0	1.2	116	1,2,3,4,6,7,8-HpCDD-13C	2.0	67	
1,2,3,6,7,8-HxCDF	1.0	1.1	114	OCDD-13C	4.0	53	Y
2,3,4,6,7,8-HxCDF	1.0	1.1	106				
1,2,3,7,8,9-HxCDF	1.0	1.1	106	1,2,3,4-TCDD-13C	2.0	NA	
Total HxCDF				1,2,3,7,8,9-HxCDD-13C	2.0	NA	
1,2,3,4,7,8-HxCDD	1.0	1.1	112	2,3,7,8-TCDD-37Cl4	0.20	77	
1,2,3,6,7,8-HxCDD	1.0	1.2	121				
1,2,3,7,8,9-HxCDD	1.0	1.2	125				
Total HxCDD							
1,2,3,4,6,7,8-HpCDF	1.0	1.1	113				
1,2,3,4,7,8,9-HpCDF	1.0	1.1	109				
Total HpCDF							
1,2,3,4,6,7,8-HpCDD	1.0	1.1	110				
Total HpCDD							
OCDF	2.0	2.3	115				
OCDD	2.0	2.5	124				

Qs = Quantity Spiked
Qm = Quantity Measured
Rec. = Recovery (Expressed as Percent)
R = Recovery outside of target range

Y = RF averaging used in calculations
Nn = Value obtained from additional analysis
NA = Not Applicable
* = See Discussion

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
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Method 8290 Laboratory Control Spike Results

Lab Sample ID	LCS-50979		
Filename	U160710B_05	Matrix	Water
Total Amount Extracted	1020 mL	Dilution	NA
ICAL ID	U160204	Extracted	07/08/2016 11:40
CCal Filename(s)	U160710B_01 & U160710B_18	Analyzed	07/10/2016 13:25
Method Blank ID	BLANK-50978	Injected By	BAL

Native Isomers	**Qs** (ng)	**Qm** (ng)	% Rec.	**Internal Standards**	**ng's Added**	**Percent Recovery**
2,3,7,8-TCDF	0.20	0.19	94	2,3,7,8-TCDF-13C	2.0	92
Total TCDF				2,3,7,8-TCDD-13C	2.0	101
				1,2,3,7,8-PeCDF-13C	2.0	86
2,3,7,8-TCDD	0.20	0.16	80	2,3,4,7,8-PeCDF-13C	2.0	81
Total TCDD				1,2,3,7,8-PeCDD-13C	2.0	91
				1,2,3,4,7,8-HxCDF-13C	2.0	83
1,2,3,7,8-PeCDF	1.0	0.91	91	1,2,3,6,7,8-HxCDF-13C	2.0	86
2,3,4,7,8-PeCDF	1.0	0.99	99	2,3,4,6,7,8-HxCDF-13C	2.0	95
Total PeCDF				1,2,3,7,8,9-HxCDF-13C	2.0	95
				1,2,3,4,7,8-HxCDD-13C	2.0	92
1,2,3,7,8-PeCDD	1.0	0.85	85	1,2,3,6,7,8-HxCDD-13C	2.0	80
Total PeCDD				1,2,3,4,6,7,8-HpCDF-13C	2.0	88
				1,2,3,4,7,8,9-HpCDF-13C	2.0	99
1,2,3,4,7,8-HxCDF	1.0	1.0	104	1,2,3,4,6,7,8-HpCDD-13C	2.0	99
1,2,3,6,7,8-HxCDF	1.0	0.95	95	OCDD-13C	4.0	87 Y
2,3,4,6,7,8-HxCDF	1.0	0.91	91			
1,2,3,7,8,9-HxCDF	1.0	0.97	97	1,2,3,4-TCDD-13C	2.0	NA
Total HxCDF				1,2,3,7,8,9-HxCDD-13C	2.0	NA
1,2,3,4,7,8-HxCDD	1.0	1.00	100	2,3,7,8-TCDD-37Cl4	0.20	108
1,2,3,6,7,8-HxCDD	1.0	1.1	105			
1,2,3,7,8,9-HxCDD	1.0	1.1	108			
Total HxCDD						
1,2,3,4,6,7,8-HpCDF	1.0	1.0	101			
1,2,3,4,7,8,9-HpCDF	1.0	1.00	100			
Total HpCDF						
1,2,3,4,6,7,8-HpCDD	1.0	1.00	100			
Total HpCDD						
OCDF	2.0	2.1	104			
OCDD	2.0	2.1	107			

Qs = Quantity Spiked
Qm = Quantity Measured
Rec. = Recovery (Expressed as Percent)
R = Recovery outside of target range

Y = RF averaging used in calculations
Nn = Value obtained from additional analysis
NA = Not Applicable
* = See Discussion

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Spiked Sample Report

Client - PACE New Orleans

Client's Sample ID	SD-3-MS		
Lab Sample ID	2038933008-MS		
Filename	F160713A_03	Matrix	Solid
Total Amount Extracted	13.3 g	Dilution	5
ICAL ID	F160602	Extracted	07/06/2016 17:50
CCal Filename(s)	F160713A_01 & F160713A_17	Analyzed	07/13/2016 00:36
Method Blank ID	BLANK-50948	Injected By	CVS

Native Isomers	Qs (ng)	Qm (ng)	% Rec.		Internal Standards	ng's Added	Percent Recovery	
2,3,7,8-TCDF	0.20	1.39	696	D	2,3,7,8-TCDF-13C	2.00	72	D
					2,3,7,8-TCDD-13C	2.00	85	D
					1,2,3,7,8-PeCDF-13C	2.00	76	D
2,3,7,8-TCDD	0.20	0.84	419	D	2,3,4,7,8-PeCDF-13C	2.00	77	D
					1,2,3,7,8-PeCDD-13C	2.00	78	D
					1,2,3,4,7,8-HxCDF-13C	2.00	77	D
1,2,3,7,8-PeCDF	1.00	2.84	284	D	1,2,3,6,7,8-HxCDF-13C	2.00	76	D
2,3,4,7,8-PeCDF	1.00	11.91	1191	D	2,3,4,6,7,8-HxCDF-13C	2.00	77	D
					1,2,3,7,8,9-HxCDF-13C	2.00	79	D
					1,2,3,4,7,8-HxCDD-13C	2.00	72	D
1,2,3,7,8-PeCDD	1.00	4.75	475	D	1,2,3,6,7,8-HxCDD-13C	2.00	72	D
					1,2,3,4,6,7,8-HpCDF-13C	2.00	86	DN2
					1,2,3,4,7,8,9-HpCDF-13C	2.00	93	D
1,2,3,4,7,8-HxCDF	1.00	18.05	1805	D	1,2,3,4,6,7,8-HpCDD-13C	2.00	119	YDN2
1,2,3,6,7,8-HxCDF	1.00	11.21	1121	D	OCDD-13C	4.00	169	RYDN2
2,3,4,6,7,8-HxCDF	1.00	20.00	2000	D				
1,2,3,7,8,9-HxCDF	1.00	9.41	941	D	1,2,3,4-TCDD-13C	2.00	NA	
					1,2,3,7,8,9-HxCDD-13C	2.00	NA	
1,2,3,4,7,8-HxCDD	1.00	19.34	1934	D	2,3,7,8-TCDD-37Cl4	0.20	88	D
1,2,3,6,7,8-HxCDD	1.00	133.56	13356	D				
1,2,3,7,8,9-HxCDD	1.00	36.08	3608	D				
1,2,3,4,6,7,8-HpCDF	1.00	378.94	37894	DN2				
1,2,3,4,7,8,9-HpCDF	1.00	34.59	3459	D				
1,2,3,4,6,7,8-HpCDD	1.00	4307.48	430748	EDN2				
OCDF	2.00	1105.38	55269	DN2				
OCDD	2.00	37929.46	1896473	EDN2				

Qs = Quantity Spiked Qm = Quantity Measured Rec. = Recovery (Expressed as Percent)

Results reported on a dry weight basis and are valid to no more than 2 significant figures.
R = Recovery outside target range
E = Exceeds calibration range
D = Result obtained from analysis of diluted sample
Nn = Value obtained from additional analysis
Y = Calculated using average of daily RFs

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Spiked Sample Report

Client - PACE New Orleans

Client's Sample ID	SD-3-MSD		
Lab Sample ID	2038933008-MSD		
Filename	F160713A_04	Matrix	Solid
Total Amount Extracted	13.4 g	Dilution	5
ICAL ID	F160602	Extracted	07/06/2016 17:50
CCal Filename(s)	F160713A_01 & F160713A_17	Analyzed	07/13/2016 01:21
Method Blank ID	BLANK-50948	Injected By	CVS

Native Isomers	Qs (ng)	Qm (ng)	% Rec.		Internal Standards	ng's Added	Percent Recovery	
2,3,7,8-TCDF	0.20	1.60	800	D	2,3,7,8-TCDF-13C	2.00	76	D
					2,3,7,8-TCDD-13C	2.00	84	D
					1,2,3,7,8-PeCDF-13C	2.00	79	D
2,3,7,8-TCDD	0.20	0.93	467	D	2,3,4,7,8-PeCDF-13C	2.00	90	D
					1,2,3,7,8-PeCDD-13C	2.00	85	D
					1,2,3,4,7,8-HxCDF-13C	2.00	78	D
1,2,3,7,8-PeCDF	1.00	3.73	373	D	1,2,3,6,7,8-HxCDF-13C	2.00	79	D
2,3,4,7,8-PeCDF	1.00	14.16	1416	D	2,3,4,6,7,8-HxCDF-13C	2.00	82	D
					1,2,3,7,8,9-HxCDF-13C	2.00	82	D
					1,2,3,4,7,8-HxCDD-13C	2.00	78	D
1,2,3,7,8-PeCDD	1.00	5.77	577	D	1,2,3,6,7,8-HxCDD-13C	2.00	70	D
					1,2,3,4,6,7,8-HpCDF-13C	2.00	84	DN2
					1,2,3,4,7,8,9-HpCDF-13C	2.00	92	D
1,2,3,4,7,8-HxCDF	1.00	23.27	2327	D	1,2,3,4,6,7,8-HpCDD-13C	2.00	102	YDN2
1,2,3,6,7,8-HxCDF	1.00	14.09	1409	D	OCDD-13C	4.00	109	YDN2
2,3,4,6,7,8-HxCDF	1.00	24.94	2494	D				
1,2,3,7,8,9-HxCDF	1.00	11.49	1149	D	1,2,3,4-TCDD-13C	2.00	NA	
					1,2,3,7,8,9-HxCDD-13C	2.00	NA	
1,2,3,4,7,8-HxCDD	1.00	21.61	2161	D	2,3,7,8-TCDD-37Cl4	0.20	90	D
1,2,3,6,7,8-HxCDD	1.00	175.18	17518	ED				
1,2,3,7,8,9-HxCDD	1.00	46.14	4614	D				
1,2,3,4,6,7,8-HpCDF	1.00	446.59	44659	DN2				
1,2,3,4,7,8,9-HpCDF	1.00	37.42	3742	D				
1,2,3,4,6,7,8-HpCDD	1.00	4286.11	428611	EDN2				
OCDF	2.00	1377.52	68876	DN2				
OCDD	2.00	36441.50	1822075	EDN2				

Qs = Quantity Spiked Qm = Quantity Measured Rec. = Recovery (Expressed as Percent)

Results reported on a dry weight basis and are valid to no more than 2 significant figures.
E = Exceeds calibration range
D = Result obtained from analysis of diluted sample
Nn = Value obtained from additional analysis
Y = Calculated using average of daily RFs

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Spike Sample Results

Client - PACE New Orleans

Client Sample ID	SD-3			Dry Weights	
Lab Sample ID	2038933008	Sample Filename	F160713A_08	Sample Amount	14.0 g
MS ID	2038933008-MS	MS Filename	F160713A_03	MS Amount	10.1 g
MSD ID	2038933008-MSD	MSD Filename	F160713A_04	MSD Amount	10.2 g

Analyte	Sample Conc. ng/Kg	MS/MSD Qs (ng)	MS Qm (ng)	MSD Qm (ng)	RPD	Background Subtracted MS % Rec.	MSD % Rec.	RPD
2,3,7,8-TCDF	81.693	0.20	1.39	1.60	14.0	281	383	30.6
2,3,7,8-TCDD	46.685	0.20	0.84	0.93	10.9	182	229	22.7
1,2,3,7,8-PeCDF	0.000	1.00	2.84	3.73	27.0	135	223	48.9
2,3,4,7,8-PeCDF	814.668	1.00	11.91	14.16	17.3	364	584	46.3
1,2,3,7,8-PeCDD	274.914	1.00	4.75	5.77	19.4	196	296	40.6
1,2,3,4,7,8-HxCDF	1247.818	1.00	18.05	23.27	25.3	539	1051	64.4
1,2,3,6,7,8-HxCDF	736.675	1.00	11.21	14.09	22.8	373	655	54.8
2,3,4,6,7,8-HxCDF	1441.773	1.00	20.00	24.94	22.0	537	1020	62.0
1,2,3,7,8,9-HxCDF	643.491	1.00	9.41	11.49	20.0	288	491	52.3
1,2,3,4,7,8-HxCDD	1310.878	1.00	19.34	21.61	11.1	604	821	30.5
1,2,3,6,7,8-HxCDD	9845.341	1.00	133.56	175.18	27.0	3365	7452	75.6
1,2,3,7,8,9-HxCDD	2574.118	1.00	36.08	46.14	24.5	996	1982	66.2
1,2,3,4,6,7,8-HpCDF	21881.265	1.00	378.94	446.59	16.4	15689	22287	34.7
1,2,3,4,7,8,9-HpCDF	2204.740	1.00	34.59	37.42	7.9	1221	1487	19.6
1,2,3,4,6,7,8-HpCDD	240508.605	1.00	4307.48	4286.11	0.5	186683	182710	2.2
OCDF	151027.763	2.00	1105.38	1377.52	21.9	0	0	0.0
OCDD	2153472.343	2.00	37929.46	36441.50	4.0	803812	721198	10.8

Definitions

MS = Matrix Spike
MSD = Matrix Spike Duplicate
Qm = Quantity Measured
Qs = Quantity Spiked
% Rec. = Percent Recovery
RPD = Relative Percent Difference
NA = Not Applicable
NC = Not Calculated

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan
T = Tetra
Pe = Penta
Hx = Hexa
Hp = Hepta
O = Octa

Stantec Consulting Services Inc.
1000 River Bend Drive, Suite R
St. Rose, LA 70087
Tel: (504) 461-9700
Fax: (504) 461-3006

July 18, 2016

Stantec Project # 175561535

Melissa MacNaughton
Pace Analytical Services
1000 Riverbend Drive, Suite F
Saint Rose, LA 70087

Subject: Grain Size Test Results
Laboratory Testing Services
Pace Analytical Services Workorder: 2038933
Workorder Name: IP Wiggins-CHB

Dear Melissa:

In accordance with your request, Stantec Consulting, Inc. performed 4 grain size tests on soil samples delivered to our Saint Rose, Louisiana laboratory by Pace Analytical Services along with the appropriate Chain-of-Custody documentation. The Pace Sample and Lab IDs were as follows:

Sample ID	Lab ID
SD-7	2038933005
SD-5	2038933007
SD-3	2038933008
SD-1	2038933009

The tests were performed in accordance with American Society for Testing and Materials (ASTM) Test Designation D422. Detailed laboratory test data sheets are attached.

We appreciate the opportunity to provide laboratory testing services for your project. If you have any questions or need additional information, please call us at (504) 461-9700.

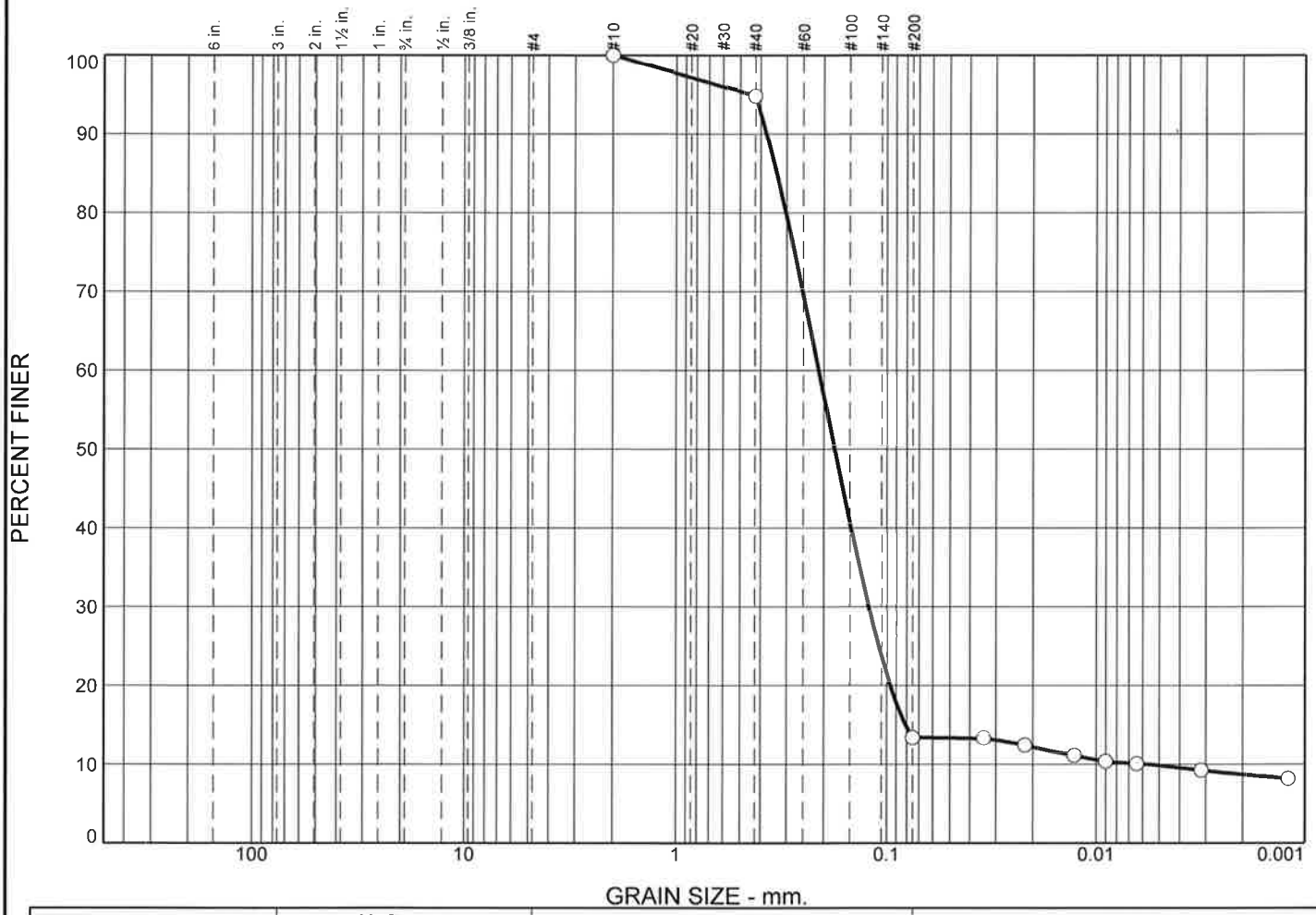
Respectfully submitted,

James J. Stone, P.E.
Associate

/js

Attachment: Particle Size Distribution Report (4 sheets)

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	5.1	81.5	3.6	9.8

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_u
○			0.3353	0.2112	0.1776	0.1221	0.0811	0.0058	12.24	36.63

Material Description	USCS	AASHTO
○ Brown and Gray Clayey Fine Sand	SC	

Project No. 175561535 **Client:** Pace Analytical

Project: Wiggins-CHB

○ **Source of Sample:** SD-1

Remarks:

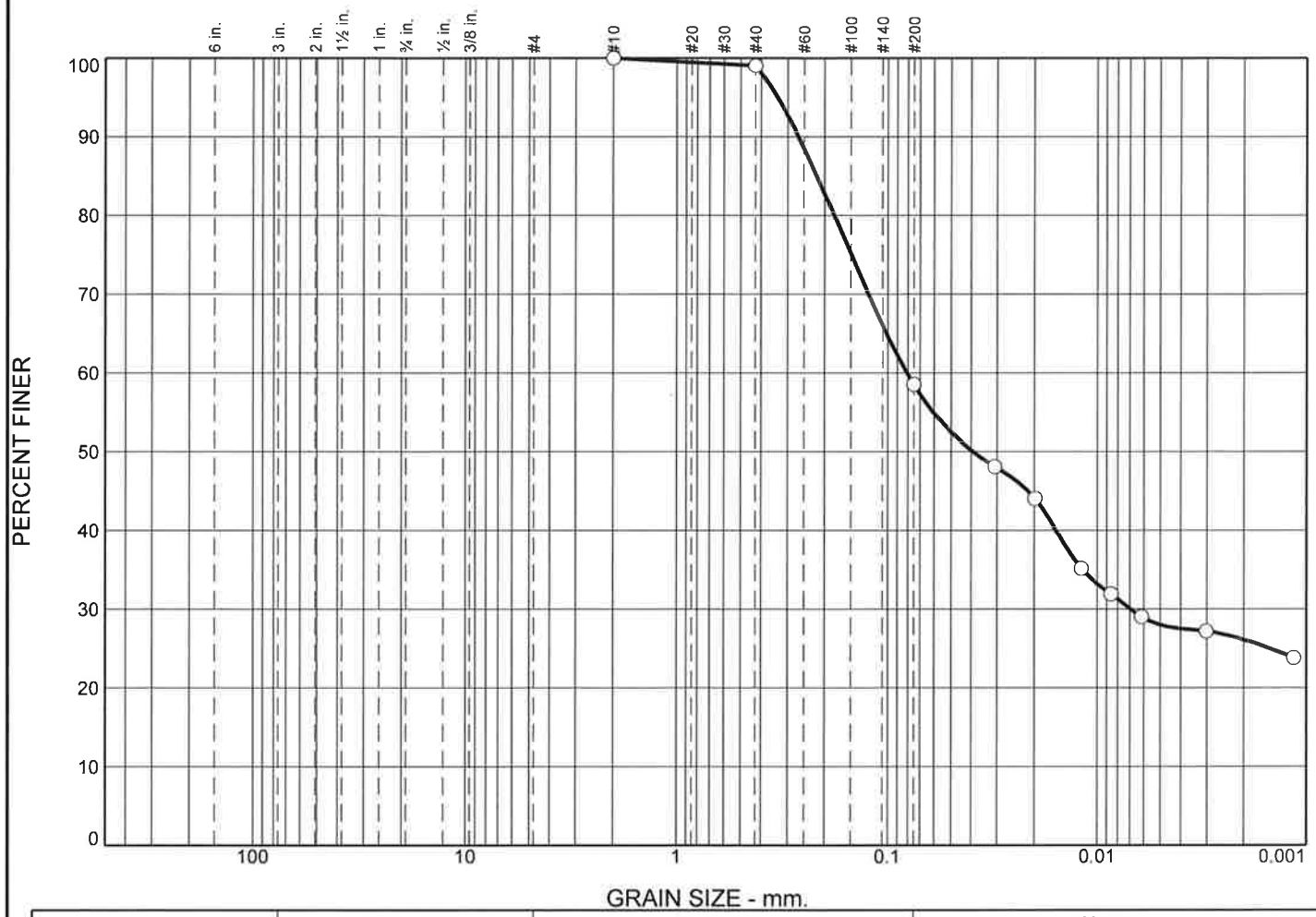
Stantec Consulting Services, Inc.

Saint Rose, Louisiana

Figure

Tested By: JC **Checked By:** MBE

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	1.0	40.5	30.5	28.0

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.2177	0.0808	0.0393	0.0069				

Material Description	USCS	AASHTO
○ Brown Sandy, Silty Clay	CL	

Project No. 175561535 **Client:** Pace Analytical
Project: Wiggins-CHB

○ **Source of Sample:** SD-3 **Sample Number:** SD-3

Remarks:

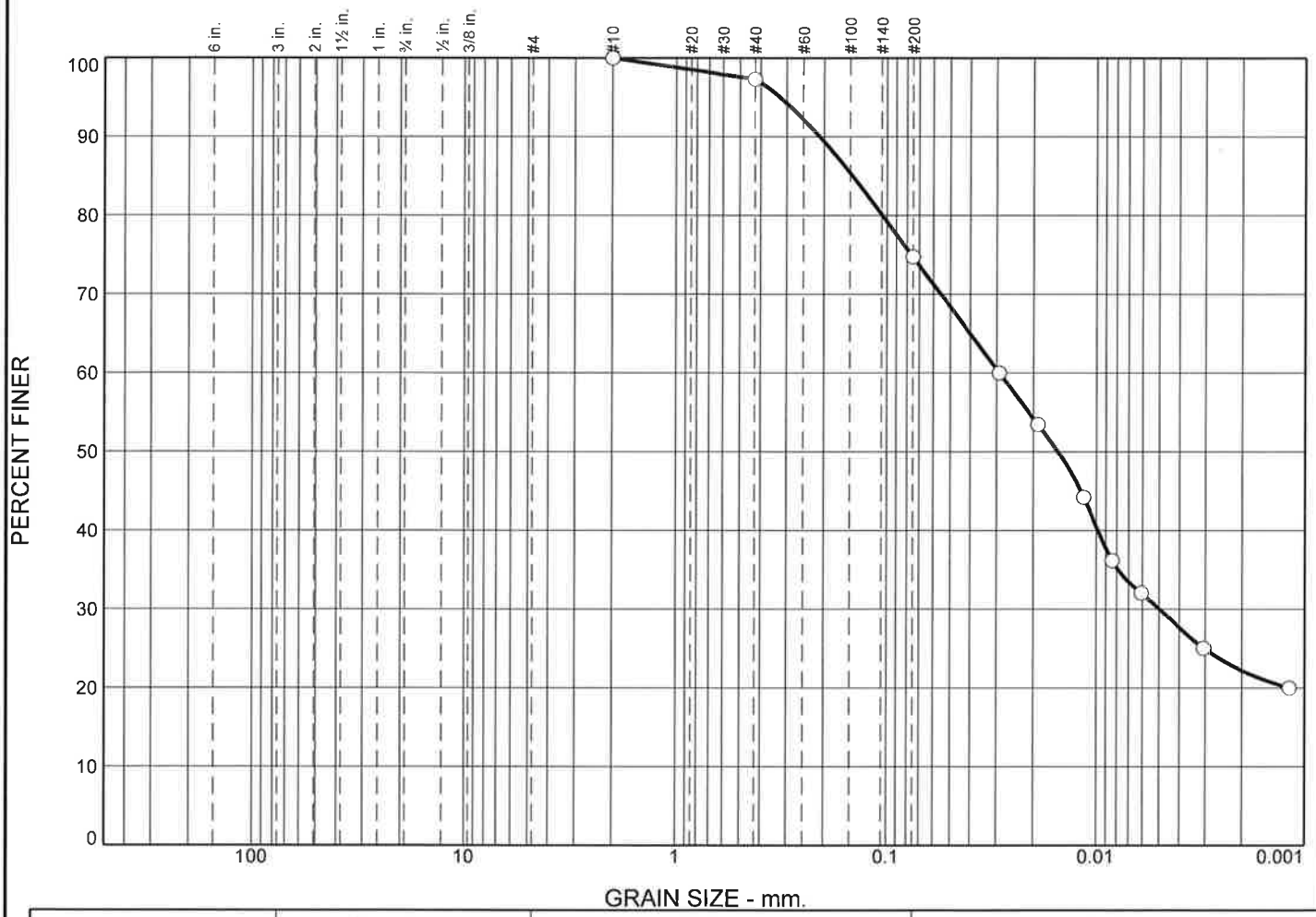
Stantec Consulting Services, Inc.

Saint Rose, Louisiana

Figure

Tested By: JC **Checked By:** MBE

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	2.7	22.6	44.6	30.1

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.1460	0.0291	0.0153	0.0050				

Material Description	USCS	AASHTO
○ Brown and Gray Silty Clay, with Sand	CL	

Project No. 175561535 **Client:** Pace Analytical

Project: Wiggins-CHB

○ **Source of Sample:** SD-5

Remarks:

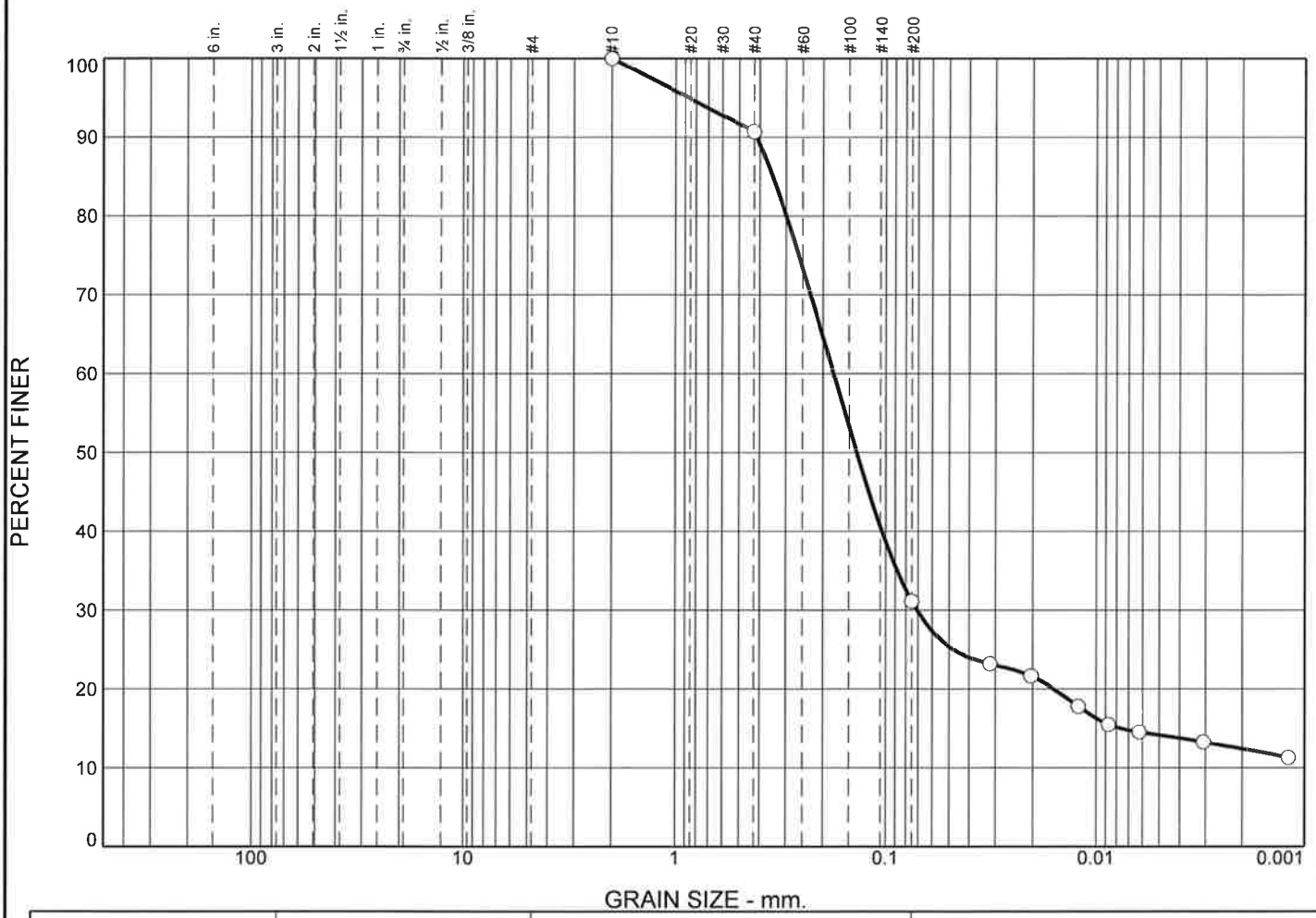
Stantec Consulting Services, Inc.

Saint Rose, Louisiana

Figure

Tested By: JC **Checked By:** MBE

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	9.3	59.6	16.9	14.2

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.3478	0.1780	0.1379	0.0709	0.0077			

	Material Description	USCS	AASHTO
○	Brown Silty Sand	SM	

Project No. 175561535 **Client:** Pace Analytical

Project: Wiggins-CHB

○ **Source of Sample:** SD-7

Remarks:

Stantec Consulting Services, Inc.

Saint Rose, Louisiana

Figure

Tested By: JC **Checked By:** MBE

Pace Analytical

CHAIN-OF-CUSTOD

The Chain-of-Custody is a LEG

ly.

WO# : 2038933

2038933

Page : 1 Of 1

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	EarthCon	Report To:	Sanchez, Laura	Attention:	Accts Payable - EarthCon
Address:	36441 Jefferson St.	Copy To:	Kgunderson@earthcon.com	Company Name:	1880 West Oak Pkwy Bldg 100
	Slidell, LA 70460			Address:	Suite 106, Marietta, GA 30062
Email:	lsanchez@earthcon.com	Purchase Order #:		Pace Quote:	
Phone:	985-788-4921 Fax:	Project Name:	Earthcon	Pace Project Manager:	melissa.macnaughton@pacelabs.com,
Requested Due Date:	Standard TAT	Project #:	Wiggins IP - CHB 08	Pace Profile #:	7609

Regulatory Agency

State / Location: MS

ITEM #	SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique)	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Dioxin High Res 8290	TOC 9060	Grain Size D422-sub	Dioxin by 8290 (High res.)	TOC 9060	6020- Copper and Hardness	6020-Diss Cu and Hardness	Various	Residual Chlorine (Y/N)
1	SW -3.5	WT	G	6/28	7 30				2	X		X												X	X		
2	SW -2.5				8 05				2	X		X												X	X		
3	SW -2.5 MS/MSD				8 05				4	X		X												X	X		
4	SW -2				8 25				2	X		X												X	X		
5	SW -1.5				8 32				2	X		X												X	X		
6	SD -7	SL	C		9 30				3	X									X	X	X						
7	SD -6				9 40				2	X									X	X							
8	SD -5				9 50				3	X									X	X	X						
9	SD -3				10 00				3	X									X	X	X						
10	SD -3 MS/MSD				10 00				4	X									X	X							
11	SD -1				10 30				3	X									X	X	X						
12	FB -1	WT			10 30				3	X	X								[illegible]	X		X					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
	Laura D Sanchez	6/28/16	1400	FedEx		
	FedEx	6/29/16	830	J.Z / PACE	6/29/16	830

SAMPLE CONDITIONS

TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
1.1	Y	Y	Y
1.7			

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Laura Sanchez for Gary Gann (G.G.)

SIGNATURE of SAMPLER: Laura D Sanchez

DATE Signed: 6/28/16

Chain of Custody

Pace Analytical®
www.pacelabs.com
10354383

Workorder: 2038933 **Workorder Name:** IP Wiggins-CHB **Owner Received Date:** 6/29/2016 **Results Requested By:** 7/21/2016

Report To	Subcontract To
Melissa MacNaughton Pace Analytical New Orleans 1000 Riverbend Blvd Suite F St. Rose, LA 70087 Phone (504)469-0333	Pace Analytical Minneapolis 1700 Elm Street SE Minneapolis, MN 55414 Phone (612)607-1700

Item	Sample ID	Sample Type	Collect Date/Time	Lab ID	Matrix	Preserved Containers: Unpreserved	4oz	Agiz				Requested Analysis: 8290	dioxin / furans											LAB USE ONLY
1	SD-7	PS	6/28/2016 09:30	2038933005	Solid	1	X					X												001
2	SD-6	PS	6/28/2016 09:40	2038933006	Solid	1	X					X												002
3	SD-5	PS	6/28/2016 09:50	2038933007	Solid	1	X					X												003
4	SD-3	RQS	6/28/2016 10:00	2038933008	Solid	1	X					X												004
5	SD-1	PS	6/28/2016 10:30	2038933009	Solid	1	X					X												005
6	FB-1	PS	6/28/2016 10:30	2038933010	Water	1		X				X												006

Transfers	Released By	Date/Time	Received By	Date/Time
1	[signature] PACE	6/29/16 1700	FedEx	6/29/16 1700
2	[signature]		[signature]	6/30/16 1015
3				

Comments

Cooler Temperature on Receipt 3.6 °C **Custody Seal** Y or (N) **Received on Ice** (Y) or N **Samples Intact** (Y) or N

****In order to maintain client confidentiality, location/name of the sampling site, sampler's name and signature may not be provided on this COC document.*
This chain of custody is considered complete as is since this information is available in the owner laboratory.

EARTHCON®
Environmental Challenges
BUSINESS SOLUTIONS ®

EarthCon Consultants, Inc.
129 Monohon Landing Road
Raymond, Washington 98577

P: 360-942-3409
M: 360-942-8927
F: 360-942-6060
kgunderson@earthcon.com
www.earthcon.com

MEMORANDUM

DATE: August 2, 2016
TO: Doug Seely, EarthCon Consultants
FROM: Kathy J. Gunderson, Senior Scientist
SUBJECT: Data Quality Review
PROJECT: IP, Supplemental CMS, Closed Former Wood Treatment Facility, Wiggins, Mississippi
RE: Surface Water and Sediment Samples Collected June 2016
PROJECT #: 02.20020008.15

1.0 Introduction

This memorandum presents the data quality review of the analytical results of four sediment samples, three surface water samples, two field duplicates, and one field blank collected June 28, 2016 as part of the Corrective Measures Study at the Closed Former Wood Treatment faculty in Wiggins, Mississippi. The samples were analyzed for polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), total and dissolved metals, total and dissolved hardness, total organic carbon (TOC), and moisture content by the methods listed in **Table 1**. The samples were analyzed by Pace Analytical Services, Inc. in their St. Rose, Louisiana, Green Bay, Wisconsin, and Minneapolis Minnesota laboratories.

The quality assurance criteria used to assess the data are from the Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (USEPA 1994), the National Functional Guidelines for Chlorinated Dioxin/Furan Data Review (USEPA 2011), the analytical methods, or the professional judgment of the validation chemist. The target detection limits are from the Supplemental CMS Field Sampling Plan (ECC 2015). The following laboratory deliverables were evaluated during the review process:

- Chain-of-custody (COC) documentation to assess holding times and verify report completeness

- Laboratory quality control (QC) sample results, including method blanks, surrogate spikes, laboratory control samples (LCSs), matrix spike/matrix spike duplicates (MS/MSDs), and laboratory duplicates

- Field QC samples to assess equipment and trip blank contamination and field duplicate precision

Field duplicate precision is presented in **Table 2** and the qualified data are summarized in **Table 3**. Tables are located at the end of this memorandum. Data qualifier flags have been added the hardcopy laboratory report used for validation and the project data tables.

2.0 Data Validation Findings

2.1 Custody, Preservation, and Completeness – Acceptable

Sample custody was maintained as required from sample collection to receipt at the laboratory. The samples were received intact and were properly preserved. The report is complete and contains results for the samples and tests requested on the COC form.

2.2 Polychlorinated Dibenzodioxin and Polychlorinated Dibenzofuran Analyses

The sediment samples and the field blank were analyzed for PCDDs/PCDFs by Method 8290.

2.2.1 Holding Times – Acceptable

The samples were extracted within the method holding time of 30 days from collection for water and soil samples. The sample extracts were analyzed within the method holding time of 45 days from extraction.

2.2.2 Blank Analyses – Acceptable

2.2.2.1 Method Blanks

Method blanks were analyzed at the required frequency of one per extraction batch. PCDDs/PCDFs were not detected above the reporting limits in the method blanks.

2.2.2.2 Field Blanks

One field blank was collected with the sediment samples. The equipment rinse blank is free of positive results above the reporting limits.

2.2.3 Isotope Dilution Internal Standard (Surrogate) Analyses – Acceptable with Discussion

Labeled isotope dilution internal standard compounds were added to the samples, blanks, and QC samples as required. With one exception, the recovery values are within the Method 8290 criteria of 40 to 135 percent.

- The OCDD-^{13}C recovery in the matrix spike analysis of sample SD-3 is above criteria at 169 percent. Data qualifiers are not required for laboratory QC samples.

2.2.4 Cleanup Recovery Internal Standard Analyses – Acceptable

The labeled cleanup recovery internal standard was added to the samples (and associated QC samples) that required cleanup. Method 8290 does not list cleanup recovery criteria. The cleanup recovery internal standards meet the Method 1613B (USEPA 1994) criteria of 35 to 197 percent recovery.

2.2.5 Laboratory Control Sample Analyses – Acceptable

LCSs were analyzed at the required frequency of one per extraction batch to monitor method performance. The recovery values are within the laboratory control limits.

2.2.6 Matrix Spike/Matrix Spike Duplicate Analyses – Acceptable with Qualification

Sample SD-3 was spiked as the MS/MSD as requested on the COC form. Due to high levels of target analytes, several recovery and RPD values are outside the laboratory control limits of 70 to 130 percent and the Method 8290 RPD criteria of less than 25. MS/MSD results were not reported with the field blank.

- With the exception of 1,2,3,7,8-PeCDF, the native sample concentrations overwhelm the amount spiked. Data qualifies are not required for out-of-criteria spike recovery when the native sample concentration exceeds the amount spiked by a factor of four or greater.

- The 1,2,3,4,7,8-HxCDF RPD value is above the method criteria at 25.3. The 1,2,3,4,6,7,8-HxCDF result of sample SD-3 is qualified as estimated (J) due to the imprecision between the MS and MSD.

- The 1,2,3,7,8-PeCDF RPD value is above the method criteria at 27.0. Data qualifiers are not required because 1,2,3,6,7,8-PeCDF was not detected in sample SD-3.

- The 1,2,3,6,7,8-HxCDD RPD value is above the method criteria at 27.0. Data qualifiers are not required because 1,2,3,6,7,8-HxCDD

concentrations in the unspiked sample, MS, and MSD are above the calibration range.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
SD-3	1,2,3,4,7,8-HxCDF	J	MS/MSD RPD above Method criteria

2.2.7 Compound Identification – Acceptable with Qualification

Second column confirmational analyses of 2,3,7,8-TCDF was not performed.

- Pace states in the case narrative that the GC peak resolution of 2,3,7,8-TCDF is adequate and second column confirmation was not performed.
- Possible interference of polychlorinated diphenylethers (PCDEs) was reported in several soil samples (laboratory P flag). The affected results are reported as estimated maximum possible concentrations (EMPCs) and are qualified as estimated (J) as shown below and in Table 3.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
SD-7	1,2,3,6,7,8-HxCDF	J	Possible PCDE interference
SD-6	1,2,3,6,7,8-HxCDF	J	Possible PCDE interference
SD-5	1,2,3,6,7,8-HxCDF	J	Possible PCDE interference
SD-3	1,2,3,7,8-PeCDF	J	Possible PCDE interference

2.2.8 Laboratory Reporting Limits – Acceptable with Qualification

Project reporting limits were not specified for PCDDs/PCDFs in water or sediment. The reporting limits utilized by the laboratory are reasonable for the analytical method.

- The results listed below exceeded the calibration range. Ideally, the samples should have been analyzed at a larger dilution. Results above the calibration range (laboratory E flag) are qualified as estimated (J) as noted below.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
SD-7	OCDD	J	Result exceeds calibration range
SD-6	OCDD	J	Result exceeds calibration range
SD-5	OCDD	J	Result exceeds calibration range
SD-3	1,2,3,6,7,8-HxCDD	J	Result exceeds calibration range
SD-3	1,2,3,4,6,7,8-HpCDD	J	Result exceeds calibration range
SD-3	OCDD	J	Result exceeds calibration range
SD-3	Total TCDD	J	Result exceeds calibration range
SD-3	Total PeCDD	J	Result exceeds calibration range
SD-3	Total HxCDD	J	Result exceeds calibration range
SD-3	Total HpCDD	J	Result exceeds calibration range

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2.2.9 Field Duplicates – Acceptable

One field duplicate was collected with the samples. RPD values less than or equal to 45 are acceptable precision for sediment samples. Field duplicate precision is acceptable as shown by the low RPD values in **Table 2**.

2.2.10 Overall Assessment of Data Usability

The usability of the data is based on the EPA guidance documents noted previously. Upon consideration of the information presented here, the data are acceptable. The data qualifier flags modify the usefulness of the individual values.

2.3 Total and Dissolved Metals and Hardness Analyses

The surface water samples were analyzed for total and dissolved calcium, copper, and manganese by Method 3010/6020. The surface water samples were also analyzed for total and dissolved hardness by Method 2340B. Calcium and magnesium analyses were performed as part of the hardness calculation.

2.3.1 Holding Times – Acceptable

The samples were analyzed within the method-required holding time of 180 days.

2.3.2 Blank Analyses – Acceptable with Discussion

2.3.2.1 Method Blanks

Method blanks were analyzed at the required frequency of one per digestion batch. With one exception target constituents were not detected in the method blanks.

- Total hardness was detected in the method blank at 0.0026 mg/L. Data qualifiers are not required because the total hardness concentrations in the samples are greater than five times the method blank concentration.

2.3.3 Laboratory Control Sample Analyses – Acceptable

LCSs were analyzed at the required frequency of one per digestion batch. The recovery values are within Functional Guidelines criteria of 80 to 120 percent.

2.3.4 Matrix Spiked Sample Analyses – Acceptable with Discussion

Sample SW-2.5 was analyzed as the MS/MSDs for metals. The recovery values are within the laboratory control limits, except as noted below.

- The dissolved calcium MSD recovery value in the spiked analysis of sample SW-2.5 is above the laboratory limits of 75 to 125 percent at 133 percent. Data qualifiers are not required because the MS recovery value is acceptable at 118 percent.

2.3.5 Laboratory Duplicate Sample Analysis – Acceptable

The laboratory analyzed MS/MSDs to satisfy the precision requirement of the method. The RPD values are within the laboratory control limits.

2.3.6 Laboratory Reporting Limits – Acceptable

Total and dissolved copper and hardness were analyzed as required on the COC form. Note that the calcium and magnesium reported for the water samples were used in the calculation of hardness. The copper MDL is lower than the Eco-Screening level of 2.74 µg/L.

2.3.7 Field Duplicates – Acceptable

One field duplicate was collected with the surface water samples. RPD values less than or equal to 35 are acceptable precision for water samples. As Shown in **Table 2**, field duplicates precision is acceptable.

2.3.8 Overall Assessment of Data Usability

The usability of the data is based on the EPA guidance documents noted previously. Upon consideration of the information presented here, the data are acceptable.

2.4 Total Organic Carbon (TOC) and Moisture Analyses

The sediment samples were analyzed for total organic carbon (TOC) by Method 9060 and moisture content by ASTM Method D2974-87. The field blank was analyzed for TOC by Method 9060.

2.4.1 Holding Times – Acceptable

The sediment samples were analyzed within the method holding times of 28 days for TOC and seven days for percent moisture.

2.4.2 Blank Analyses – Acceptable

2.4.2.1 Method Blanks

Method blanks were analyzed at the required frequency of one per batch for TOC. Method blanks are not required for moisture content since it is not a trace level analysis. TOC was not detected in the method blank.

2.4.2.2 Field Blanks

One field blank was collected with the samples. TOC was not reported in the field blank.

2.4.3 Laboratory Control Sample Analyses – Acceptable

LCSs were analyzed at the required frequency of one per batch for TOC. The recovery values are within the laboratory control limits.

2.4.4 Matrix Spike Analyses – Acceptable

Sample SD-3 was analyzed as the MS/MSD for TOC. The recovery values are within the laboratory control limits. Matrix spikes were not reported with the field blank.

2.4.5 Laboratory Duplicates – Acceptable

Laboratory duplicates or MSDs were analyzed at the required frequency of one per batch for TOC in sediment and percent moisture. A duplicate was not reported with TOC in water. The RPD values are within the laboratory control limits.

2.4.6 Laboratory Reporting Limits – Acceptable

Project reporting limits were not specified for TOC or moisture content. The detection limits used by the laboratory are reasonable for the analytical methods.

2.4.7 Field Duplicate Precision – Acceptable

One field duplicate was collected with the samples. RPD values less than or equal to 45 are considered acceptable precision for sediment samples. As Shown in **Table 2**, field duplicates precision is acceptable.

2.4.8 Overall Assessment of Data Usability

The usability of the data is based on the EPA guidance documents noted previously. Upon consideration of the information presented here, the data are acceptable.

3.0 Data Qualifier Definitions

3.1 Organic Data Qualifiers

The following data validation qualifiers were used in the review of this data set. These qualifiers are from the *Contract Laboratory Program National Functional Guidelines for Organic Data Review*.

U The analyte was analyzed for but not detected above the reported sample quantitation limit.

J The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

N The analysis indicates the presence of an analyte for which there is presumptive evidence to make a “tentative identification”.

NJ The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

R The sample results are rejected due to serious deficiencies in the ability to analyze the samples and meet quality control criteria. The presence or absence of the analyte cannot be verified.

3.2 Inorganic Data Qualifiers

The following data validation qualifiers were used in the review of this data set. These qualifiers are from the *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*.

U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

J The associated value is an estimated quantity.

UJ The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

R The data are unusable. (Note: Analyte may or may not be present.)

4.0 References

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ECC. 2015. Supplemental CMS Field Sampling Plan, SWMU37 Drainage Ditches & AOC B Church House Branch, International Paper, Former Wood Treating Units, Wiggins, MS. EarthCon Consultants, Inc., Sommer4ville, MA, May 21, 2015.

USEPA. 1994. Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. United States Environmental Protection Agency. Office of Solid Waste and Emergence Response. February 1994.

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USEPA. 2011. National Functional Guidelines for Chlorinated Dioxin/Furan Data Review. EPA Analytical Operations/Data Quality Center. September 2011. EPA 540-R-02-003.

USEPA. 1994. Method 1613B Tetra- through Octa-Chlorinated Dioxins and Furans by Isotope Dilution HRGC/HRMS. U.S. Environmental Protection Agency Office of Water Engineering and Analytical Division. October 1994.

Table 1 – Sample Data Reviewed

Sample ID	Laboratory ID	Dioxins[a]	Metals[b]	TOC[c]	Hardness[d]	%Moisture[d]
SW-3.5	2038933001		X		X	
SW-2.5	2038933002		X		X	
SW-2	2038933003		X		X	
SW-1.5	2038933004		X		X	
SD-7	2038933005	X		X		X
SD-6	2038933006	X		X		X
SD-5	2038933007	X		X		X
SD-3	2038933008	X		X		X
SD-1	2038933009	X		X		X
FB-1	2038933010	X		X		

[a] Polychlorinated Dibenzodioxin and Polychlorinated Dibenzofuran Analyses by Method 8290 (USEPA 1996)
[b] Total and dissolved calcium, copper, and magnesium by Method 3010/6020 (USEPA 1996)
[c] Total Organic Carbon (TOC) by Method 9060 (USEPA 1996)
[d] Total and dissolved hardness by Standard Methods 2340B (APHA 1998)

Table 2 – Field Duplicate Precision

Analyte	Units	SD-6 Result	SD-5 Result	RPD
2,3,7,8-TCDF	ng/Kg	14	15	6.9
2,3,7,8-TCDD	ng/Kg	14	13	7.4
1,2,3,7,8-PeCDF	ng/Kg	70	68	2.9
2,3,4,7,8-PeCDF	ng/Kg	180	180	0.0
1,2,3,7,8-PeCDD	ng/Kg	220	200	9.5
1,2,3,4,7,8-HxCDF	ng/Kg	600	530	12.4
2,3,4,6,7,8-HxCDF	ng/Kg	850	730	15.2
1,2,3,7,8,9-HxCDF	ng/Kg	210	190	10.0
1,2,3,4,7,8-HxCDD	ng/Kg	660	600	9.5
1,2,3,6,7,8-HxCDD	ng/Kg	3400	3300	3.0
1,2,3,7,8,9-HxCDD	ng/Kg	1600	1500	6.5
1,2,3,4,6,7,8-HpCDF	ng/Kg	16,000	14,000	13.3
1,2,3,4,7,8,9-HpCDF	ng/Kg	1800	1400	25.0
1,2,3,4,6,7,8-HpCDD	ng/Kg	88,000	94,000	6.6
OCDF	ng/Kg	53,000	46,000	14.1
OCDD	ng/Kg	870,000	800,000	8.4
Moisture content	%	60.5	62.8	3.7
Mean total organic carbon (TOC)	mg/kg	24,400	25,000	2.4
Analyte	**Units**	**SW-3.5 Result**	**SW-2 Result**	**RPD[a]**
Total calcium	mg/L	3.2	3.1	3.2
Total copper	mg/L	0.0043	0.0046	6.7
Total magnesium	mg/L	0.73	0.71	2.8
Total hardness	mg/L	11.1	10.7	3.7
Dissolved calcium	mg/L	3.0	2.9	3.4
Dissolved copper	mg/L	0.0024	0.0032	28
Dissolved magnesium	mg/L	0.67	0.66	1.5
Dissolved hardness	mg/L	10.4	10.0	3.9

RPD Relative percent difference

Table 3 – Summary of Qualified Data

Sample ID	Analyte	Qualifier	Quality Control Exceedance
SD-3	1,2,3,4,7,8-HxCDF	J	MS/MSD RPD above Method criteria
SD-7	1,2,3,6,7,8-HxCDF	J	Possible PCDE interference
SD-6	1,2,3,6,7,8-HxCDF	J	Possible PCDE interference
SD-5	1,2,3,6,7,8-HxCDF	J	Possible PCDE interference
SD-3	1,2,3,7,8-PeCDF	J	Possible PCDE interference
SD-7	OCDD	J	Result exceeds calibration range
SD-6	OCDD	J	Result exceeds calibration range
SD-5	OCDD	J	Result exceeds calibration range
SD-3	1,2,3,6,7,8-HxCDD	J	Result exceeds calibration range
SD-3	1,2,3,4,6,7,8-HpCDD	J	Result exceeds calibration range
SD-3	OCDD	J	Result exceeds calibration range
SD-3	Total TCDD	J	Result exceeds calibration range
SD-3	Total PeCDD	J	Result exceeds calibration range
SD-3	Total HxCDD	J	Result exceeds calibration range
SD-3	Total HpCDD	J	Result exceeds calibration range

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ANALYTICAL RESULTS

Project: IP Wiggins-CHB
Pace Project No.: 2038933

Sample: SW-3.5 **Lab ID: 2038933001** Collected: 06/28/16 07:30 Received: 06/29/16 08:30 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010								
Calcium	**3.2**	mg/L	0.10	0.050	1	06/30/16 19:00	07/08/16 12:26	7440-70-2	
Copper	**0.0043**	mg/L	0.0030	0.0015	1	06/30/16 19:00	07/08/16 12:26	7440-50-8	
Magnesium	**0.73**	mg/L	0.10	0.050	1	06/30/16 19:00	07/08/16 12:26	7439-95-4	
Total Hardness	**11.1**	mg/L	0.0050	0.0025	1	06/30/16 19:00	07/08/16 12:26		
6020 MET ICPMS, Dissolved (LF)	Analytical Method: EPA 6020 Preparation Method: EPA 3005A								
Calcium, Dissolved	**3.0**	mg/L	0.10	0.050	1	06/30/16 19:10	07/08/16 11:44	7440-70-2	
Copper, Dissolved	**0.0024J**	mg/L	0.0030	0.0015	1	06/30/16 19:10	07/08/16 11:44	7440-50-8	
Magnesium, Dissolved	**0.67**	mg/L	0.10	0.050	1	06/30/16 19:10	07/08/16 11:44	7439-95-4	
Total Hardness, Dissolved	**10.4**	mg/L			1	06/30/16 19:10	07/08/16 11:44		

Sample: SW-2.5 **Lab ID: 2038933002** Collected: 06/28/16 08:05 Received: 06/29/16 08:30 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010								
Calcium	**3.1**	mg/L	0.10	0.050	1	06/30/16 19:00	07/08/16 12:03	7440-70-2	
Copper	**0.0046**	mg/L	0.0030	0.0015	1	06/30/16 19:00	07/08/16 12:03	7440-50-8	
Magnesium	**0.71**	mg/L	0.10	0.050	1	06/30/16 19:00	07/08/16 12:03	7439-95-4	
Total Hardness	**10.7**	mg/L	0.0050	0.0025	1	06/30/16 19:00	07/08/16 12:03		
6020 MET ICPMS, Dissolved (LF)	Analytical Method: EPA 6020 Preparation Method: EPA 3005A								
Calcium, Dissolved	**2.9**	mg/L	0.10	0.050	1	06/30/16 19:10	07/08/16 11:28	7440-70-2	M1
Copper, Dissolved	**0.0032**	mg/L	0.0030	0.0015	1	06/30/16 19:10	07/08/16 11:28	7440-50-8	
Magnesium, Dissolved	**0.66**	mg/L	0.10	0.050	1	06/30/16 19:10	07/08/16 11:28	7439-95-4	
Total Hardness, Dissolved	**10.0**	mg/L			1	06/30/16 19:10	07/08/16 11:28		

Sample: SW-2 **Lab ID: 2038933003** Collected: 06/28/16 08:25 Received: 06/29/16 08:30 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010								
Calcium	**3.2**	mg/L	0.10	0.050	1	06/30/16 19:00	07/08/16 12:30	7440-70-2	
Copper	**0.0043**	mg/L	0.0030	0.0015	1	06/30/16 19:00	07/08/16 12:30	7440-50-8	
Magnesium	**0.71**	mg/L	0.10	0.050	1	06/30/16 19:00	07/08/16 12:30	7439-95-4	
Total Hardness	**10.9**	mg/L	0.0050	0.0025	1	06/30/16 19:00	07/08/16 12:30		
6020 MET ICPMS, Dissolved (LF)	Analytical Method: EPA 6020 Preparation Method: EPA 3005A								
Calcium, Dissolved	**3.2**	mg/L	0.10	0.050	1	06/30/16 19:10	07/08/16 11:47	7440-70-2	
Copper, Dissolved	**0.0026J**	mg/L	0.0030	0.0015	1	06/30/16 19:10	07/08/16 11:47	7440-50-8	
Magnesium, Dissolved	**0.71**	mg/L	0.10	0.050	1	06/30/16 19:10	07/08/16 11:47	7439-95-4	
Total Hardness, Dissolved	**10.9**	mg/L			1	06/30/16 19:10	07/08/16 11:47		

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ANALYTICAL RESULTS

Project: IP Wiggins-CHB
Pace Project No.: 2038933

Sample: SW-1.5 **Lab ID: 2038933004** Collected: 06/28/16 08:32 Received: 06/29/16 08:30 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010								
Calcium	**2.9**	mg/L	0.10	0.050	1	06/30/16 19:00	07/08/16 12:33	7440-70-2	
Copper	**0.0021J**	mg/L	0.0030	0.0015	1	06/30/16 19:00	07/03/16 12:33	7440-50-8	
Magnesium	**0.70**	mg/L	0.10	0.050	1	06/30/16 19:00	07/08/16 12:33	7439-95-4	
Total Hardness	**10.1**	mg/L	0.0050	0.0025	1	06/30/16 19:00	07/08/16 12:33		
6020 MET ICPMS, Dissolved (LF)	Analytical Method: EPA 6020 Preparation Method: EPA 3005A								
Calcium, Dissolved	**2.9**	mg/L	0.10	0.050	1	06/30/16 19:10	07/08/16 11:59	7440-70-2	
Copper, Dissolved	ND	mg/L	0.0030	0.0015	1	06/30/16 19:10	07/08/16 11:59	7440-50-8	
Magnesium, Dissolved	**0.68**	mg/L	0.10	0.050	1	06/30/16 19:10	07/08/16 11:59	7439-95-4	
Total Hardness, Dissolved	**9.9**	mg/L			1	06/30/16 19:10	07/08/16 11:59		

Sample: SD-7 **Lab ID: 2038933005** Collected: 06/28/16 09:30 Received: 06/29/16 08:30 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**30.3**	%	0.10	0.10	1		07/05/16 11:42		
Total Organic Carbon Quad	Analytical Method: EPA 9060								
Total Organic Carbon	**8050**	mg/kg	1210	363	1		07/14/16 07:27	7440-44-0	
Total Organic Carbon	**8150**	mg/kg	1200	360	1		07/14/16 07:32	7440-44-0	
Total Organic Carbon	**8230**	mg/kg	1220	366	1		07/14/16 07:39	7440-44-0	
Total Organic Carbon	**7760**	mg/kg	1210	362	1		07/14/16 07:45	7440-44-0	
Mean Total Organic Carbon	**8050**	mg/kg	1210	363	1		07/14/16 07:27	7440-44-0	
Surrogates									
RSD%	**2.6**	%			1		07/14/16 07:27		

Sample: SD-6 **Lab ID: 2038933006** Collected: 06/28/16 09:40 Received: 06/29/16 08:30 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**62.8**	%	0.10	0.10	1		07/05/16 11:52		
Total Organic Carbon Quad	Analytical Method: EPA 9060								
Total Organic Carbon	**21600**	mg/kg	2990	896	1		07/14/16 07:51	7440-44-0	
Total Organic Carbon	**28500**	mg/kg	3040	911	1		07/14/16 07:58	7440-44-0	
Total Organic Carbon	**25000**	mg/kg	2990	897	1		07/14/16 08:04	7440-44-0	
Total Organic Carbon	**25000**	mg/kg	3010	903	1		07/14/16 08:11	7440-44-0	
Mean Total Organic Carbon	**25000**	mg/kg	3010	902	1		07/14/16 07:51	7440-44-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: IP Wiggins-CHB
Pace Project No.: 2038933

Sample: SD-6 **Lab ID: 2038933006** Collected: 06/28/16 09:40 Received: 06/29/16 08:30 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Total Organic Carbon Quad	Analytical Method: EPA 9060								
Surrogates									
RSD%	**11.3**	%			1		07/14/16 07:51		

Sample: SD-5 **Lab ID: 2038933007** Collected: 06/28/16 09:50 Received: 06/29/16 08:30 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**60.5**	%	0.10	0.10	1		07/05/16 11:53		
Total Organic Carbon Quad	Analytical Method: EPA 9060								
Total Organic Carbon	**23000**	mg/kg	2000	601	1		07/14/16 08:17	7440-44-0	
Total Organic Carbon	**22600**	mg/kg	2020	606	1		07/14/16 08:24	7440-44-0	
Total Organic Carbon	**26100**	mg/kg	1960	588	1		07/14/16 08:31	7440-44-0	
Total Organic Carbon	**25800**	mg/kg	2000	599	1		07/14/16 08:39	7440-44-0	
Mean Total Organic Carbon	**24400**	mg/kg	1990	598	1		07/14/16 08:17	7440-44-0	
Surrogates									
RSD%	**7.4**	%			1		07/14/16 08:17		

Sample: SD-3 **Lab ID: 2038933008** Collected: 06/28/16 10:00 Received: 06/29/16 08:30 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**23.7**	%	0.10	0.10	1		07/05/16 11:53		
Total Organic Carbon Quad	Analytical Method: EPA 9060								
Total Organic Carbon	**4640**	mg/kg	646	194	1		07/14/16 08:47	7440-44-0	
Total Organic Carbon	**5290**	mg/kg	649	195	1		07/14/16 08:53	7440-44-0	
Total Organic Carbon	**5720**	mg/kg	653	196	1		07/14/16 09:05	7440-44-0	
Total Organic Carbon	**5120**	mg/kg	647	194	1		07/14/16 09:11	7440-44-0	
Mean Total Organic Carbon	**5190**	mg/kg	649	195	1		07/14/16 08:47	7440-44-0	
Surrogates									
RSD%	**8.6**	%			1		07/14/16 08:47		

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ANALYTICAL RESULTS

Project: IP Wiggins-CHB
Pace Project No.: 2038933

Sample: SD-1 **Lab ID: 2038933009** Collected: 06/28/16 10:30 Received: 06/29/16 08:30 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**20.3**	%	0.10	0.10	1		07/05/16 11:53		
Total Organic Carbon Quad	Analytical Method: EPA 9060								
Total Organic Carbon	**3190**	mg/kg	642	193	1		07/14/16 10:05	7440-44-0	
Total Organic Carbon	**4530**	mg/kg	652	196	1		07/14/16 10:11	7440-44-0	
Total Organic Carbon	**5300**	mg/kg	645	194	1		07/14/16 10:17	7440-44-0	
Total Organic Carbon	**5150**	mg/kg	650	195	1		07/14/16 10:23	7440-44-0	
Mean Total Organic Carbon	**4540**	mg/kg	648	194	1		07/14/16 10:05	7440-44-0	
Surrogates									
RSD%	**21.2**	%			1		07/14/16 10:05		

Sample: FB-1 **Lab ID: 2038933010** Collected: 06/28/16 10:30 Received: 06/29/16 08:30 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Total Organic Carbon, Quad	Analytical Method: EPA 9060								
Total Organic Carbon	ND	mg/L	1.0	0.50	1		07/19/16 09:49	7440-44-0	
Total Organic Carbon	ND	mg/L	1.0	0.50	1		07/19/16 09:49	7440-44-0	
Total Organic Carbon	ND	mg/L	1.0	0.50	1		07/19/16 09:49	7440-44-0	
Total Organic Carbon	ND	mg/L	1.0	0.50	1		07/19/16 09:49	7440-44-0	
Mean Total Organic Carbon	ND	mg/L	1.0	0.50	1		07/19/16 09:49	7440-44-0	

KJV 7-20-16

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Sample Analysis Results

Client - PACE New Orleans

Client's Sample ID	SD-7		
Lab Sample ID	2038933005		
Filename	F160713A_11		
Injected By	CVS		
Total Amount Extracted	14.4 g	Matrix	Solid
% Moisture	30.3	Dilution	5
Dry Weight Extracted	10.0 g	Collected	06/28/2016 09:30
ICAL ID	F160602	Received	06/30/2016 10:15
CCal Filename(s)	F160713A_01 & F160713A_17	Extracted	07/06/2016 17:50
Method Blank ID	BLANK-50948	Analyzed	07/13/2016 06:34

Native Isomers	Conc ng/Kg	EMPC ng/Kg	RL ng/Kg		Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	6.8	-----	5.0	D	2,3,7,8-TCDF-13C	2.00	74 D
Total TCDF	630.0	-----	5.0	D	2,3,7,8-TCDD-13C	2.00	84 D
					1,2,3,7,8-PeCDF-13C	2.00	74 D
2,3,7,8-TCDD	10.0	-----	5.0	D	2,3,4,7,8-PeCDF-13C	2.00	73 D
Total TCDD	800.0	-----	5.0	D	1,2,3,7,8-PeCDD-13C	2.00	79 D
					1,2,3,4,7,8-HxCDF-13C	2.00	73 D
1,2,3,7,8-PeCDF	ND	-----	25.0	D	1,2,3,6,7,8-HxCDF-13C	2.00	74 D
2,3,4,7,8-PeCDF	84.0	-----	25.0	D	2,3,4,6,7,8-HxCDF-13C	2.00	79 D
Total PeCDF	2700.0	-----	25.0	D	1,2,3,7,8,9-HxCDF-13C	2.00	77 D
					1,2,3,4,7,8-HxCDD-13C	2.00	74 D
1,2,3,7,8-PeCDD	89.0	-----	25.0	D	1,2,3,6,7,8-HxCDD-13C	2.00	67 D
Total PeCDD	2000.0	-----	25.0	D	1,2,3,4,6,7,8-HpCDF-13C	2.00	77 DN2
					1,2,3,4,7,8,9-HpCDF-13C	2.00	93 DN2
1,2,3,4,7,8-HxCDF	280.0	-----	25.0	D	1,2,3,4,6,7,8-HpCDD-13C	2.00	93 YDN2
1,2,3,6,7,8-HxCDF	-----	250 J	25.0	PD	OCDD-13C	4.00	90 YDN2
2,3,4,6,7,8-HxCDF	390.0	-----	25.0	D			
1,2,3,7,8,9-HxCDF	77.0	-----	25.0	D	1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	10000.0	-----	25.0	D	1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	300.0	-----	25.0	D	2,3,7,8-TCDD-37Cl4	0.20	85 D
1,2,3,6,7,8-HxCDD	1300.0	-----	25.0	D			
1,2,3,7,8,9-HxCDD	720.0	-----	25.0	D			
Total HxCDD	9900.0	-----	25.0	D			
1,2,3,4,6,7,8-HpCDF	8100.0	-----	250.0	DN2	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	1000.0	-----	250.0	DN2	Equivalence: 1400 ng/Kg		
Total HpCDF	33000.0	-----	250.0	DN2	(Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	45000.0	-----	250.0	DN2			
Total HpCDD	72000.0	-----	250.0	DN2			
OCDF	34000.0	-----	500.0	DN2			
OCDD	390000.0 J	-----	500.0	EDN2			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
RL = Reporting Limit

ND = Not Detected
NA = Not Applicable
NC = Not Calculated

Results reported on a dry weight basis and are valid to no more than 2 significant figures.
P = PCDE Interference
E = Exceeds calibration range
D = Result obtained from analysis of diluted sample
Nn = Value obtained from additional analysis
Y = Calculated using average of daily RFs

KP 7-21-16

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Sample Analysis Results

Client - PACE New Orleans

Client's Sample ID	SD-6		
Lab Sample ID	2038933006		
Filename	F160713A_10		
Injected By	CVS		
Total Amount Extracted	26.9 g	Matrix	Solid
% Moisture	62.8	Dilution	5
Dry Weight Extracted	10.0 g	Collected	06/28/2016 09:40
ICAL ID	F160602	Received	06/30/2016 10:15
CCal Filename(s)	F160713A_01 & F160713A_17	Extracted	07/06/2016 17:50
Method Blank ID	BLANK-50948	Analyzed	07/13/2016 05:49

Native Isomers	Conc ng/Kg	EMPC ng/Kg	RL ng/Kg		Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	14	-----	5.0	D	2,3,7,8-TCDF-13C	2.00	74 D
Total TCDF	730	-----	5.0	D	2,3,7,8-TCDD-13C	2.00	82 D
					1,2,3,7,8-PeCDF-13C	2.00	78 D
2,3,7,8-TCDD	14	-----	5.0	D	2,3,4,7,8-PeCDF-13C	2.00	74 D
Total TCDD	440	-----	5.0	D	1,2,3,7,8-PeCDD-13C	2.00	81 D
					1,2,3,4,7,8-HxCDF-13C	2.00	76 D
1,2,3,7,8-PeCDF	70	-----	25.0	D	1,2,3,6,7,8-HxCDF-13C	2.00	81 D
2,3,4,7,8-PeCDF	180	-----	25.0	D	2,3,4,6,7,8-HxCDF-13C	2.00	85 D
Total PeCDF	4600	-----	25.0	D	1,2,3,7,8,9-HxCDF-13C	2.00	82 D
					1,2,3,4,7,8-HxCDD-13C	2.00	79 D
1,2,3,7,8-PeCDD	220	-----	25.0	D	1,2,3,6,7,8-HxCDD-13C	2.00	70 D
Total PeCDD	2100	-----	25.0	D	1,2,3,4,6,7,8-HpCDF-13C	2.00	86 DN2
					1,2,3,4,7,8,9-HpCDF-13C	2.00	101 DN2
1,2,3,4,7,8-HxCDF	600	-----	25.0	D	1,2,3,4,6,7,8-HpCDD-13C	2.00	100 YDN2
1,2,3,6,7,8-HxCDF	-----	470 J	25.0	PD	OCDD-13C	4.00	101 YDN2
2,3,4,6,7,8-HxCDF	850	-----	25.0	D			
1,2,3,7,8,9-HxCDF	210	-----	25.0	D	1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	19000	-----	25.0	D	1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	660	-----	25.0	D	2,3,7,8-TCDD-37Cl4	0.20	85 D
1,2,3,6,7,8-HxCDD	3400	-----	25.0	D			
1,2,3,7,8,9-HxCDD	1600	-----	25.0	D			
Total HxCDD	18000	-----	25.0	D			
1,2,3,4,6,7,8-HpCDF	16000	-----	400.0	DN2	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	1800	-----	400.0	DN2	Equivalence: 3000 ng/Kg		
Total HpCDF	55000	-----	400.0	DN2	(Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	88000	-----	400.0	DN2			
Total HpCDD	150000	-----	400.0	DN2			
OCDF	53000	-----	800.0	DN2			
OCDD	870000 J	-----	800.0	EDN2			

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Y = Calculated using average of daily RFs

KP 7-21-16

REPORT OF LABORATORY ANALYSIS

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1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Sample Analysis Results

Client - PACE New Orleans

Client's Sample ID	SD-5		
Lab Sample ID	2038933007		
Filename	F160713A_09		
Injected By	CVS		
Total Amount Extracted	25.4 g	Matrix	Solid
% Moisture	60.5	Dilution	5
Dry Weight Extracted	10.0 g	Collected	06/28/2016 09:50
ICAL ID	F160602	Received	06/30/2016 10:15
CCal Filename(s)	F160713A_01 & F160713A_17	Extracted	07/06/2016 17:50
Method Blank ID	BLANK-50948	Analyzed	07/13/2016 05:04

Native Isomers	Conc ng/Kg	EMPC ng/Kg	RL ng/Kg		Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	15	-----	5.0	D	2,3,7,8-TCDF-13C	2.00	75 D
Total TCDF	670	-----	5.0	D	2,3,7,8-TCDD-13C	2.00	83 D
					1,2,3,7,8-PeCDF-13C	2.00	79 D
2,3,7,8-TCDD	13	-----	5.0	D	2,3,4,7,8-PeCDF-13C	2.00	92 D
Total TCDD	440	-----	5.0	D	1,2,3,7,8-PeCDD-13C	2.00	87 D
					1,2,3,4,7,8-HxCDF-13C	2.00	75 D
1,2,3,7,8-PeCDF	68	-----	25.0	D	1,2,3,6,7,8-HxCDF-13C	2.00	77 D
2,3,4,7,8-PeCDF	180	-----	25.0	D	2,3,4,6,7,8-HxCDF-13C	2.00	81 D
Total PeCDF	3800	-----	25.0	D	1,2,3,7,8,9-HxCDF-13C	2.00	80 D
					1,2,3,4,7,8-HxCDD-13C	2.00	76 D
1,2,3,7,8-PeCDD	200	-----	25.0	D	1,2,3,6,7,8-HxCDD-13C	2.00	68 D
Total PeCDD	1900	-----	25.0	D	1,2,3,4,6,7,8-HpCDF-13C	2.00	88 DN2
					1,2,3,4,7,8,9-HpCDF-13C	2.00	109 DN2
1,2,3,4,7,8-HxCDF	530	-----	25.0	D	1,2,3,4,6,7,8-HpCDD-13C	2.00	98 YDN2
1,2,3,6,7,8-HxCDF	-----	440 J	25.0	PD	OCDD-13C	4.00	111 YDN2
2,3,4,6,7,8-HxCDF	730	-----	25.0	D			
1,2,3,7,8,9-HxCDF	190	-----	25.0	D	1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	17000	-----	25.0	D	1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	600	-----	25.0	D	2,3,7,8-TCDD-37Cl4	0.20	82 D
1,2,3,6,7,8-HxCDD	3300	-----	25.0	D			
1,2,3,7,8,9-HxCDD	1500	-----	25.0	D			
Total HxCDD	17000	-----	25.0	D			
1,2,3,4,6,7,8-HpCDF	14000	-----	300.0	DN2	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	1400	-----	300.0	DN2	Equivalence: 2900 ng/Kg		
Total HpCDF	49000	-----	300.0	DN2	(Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	94000	-----	300.0	DN2			
Total HpCDD	160000	-----	300.0	DN2			
OCDF	46000	-----	600.0	DN2			
OCDD	800000 J	-----	600.0	EDN2			

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KJS 7-21-16

REPORT OF LABORATORY ANALYSIS

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Pace Analytical™

Method 8290 Sample Analysis Results

Client - PACE New Orleans

Client's Sample ID	SD-3		
Lab Sample ID	2038933008		
Filename	F160713A_08		
Injected By	CVS		
Total Amount Extracted	18.4 g	Matrix	Solid
% Moisture	23.7	Dilution	5
Dry Weight Extracted	14.0 g	Collected	06/28/2016 10:00
ICAL ID	F160602	Received	06/30/2016 10:15
CCal Filename(s)	F160713A_01 & F160713A_17	Extracted	07/06/2016 17:50
Method Blank ID	BLANK-50948	Analyzed	07/13/2016 04:20

Native Isomers	Conc ng/Kg	EMPC ng/Kg	RL ng/Kg		Internal Standards	ng's Added	Percent Recovery	
2,3,7,8-TCDF	82	—	3.6	D	2,3,7,8-TCDF-13C	2.00	78	D
Total TCDF	3200	—	3.6	D	2,3,7,8-TCDD-13C	2.00	85	D
					1,2,3,7,8-PeCDF-13C	2.00	83	D
2,3,7,8-TCDD	47	—	3.6	D	2,3,4,7,8-PeCDF-13C	2.00	80	D
Total TCDD	6500 J	—	3.6	ED	1,2,3,7,8-PeCDD-13C	2.00	88	D
					1,2,3,4,7,8-HxCDF-13C	2.00	77	D
1,2,3,7,8-PeCDF	—	150 J	18.0	PD	1,2,3,6,7,8-HxCDF-13C	2.00	79	D
2,3,4,7,8-PeCDF	810	—	18.0	D	2,3,4,6,7,8-HxCDF-13C	2.00	78	D
Total PeCDF	15000	—	18.0	D	1,2,3,7,8,9-HxCDF-13C	2.00	80	D
					1,2,3,4,7,8-HxCDD-13C	2.00	75	D
1,2,3,7,8-PeCDD	270	—	18.0	D	1,2,3,6,7,8-HxCDD-13C	2.00	75	D
Total PeCDD	17000 J	—	18.0	ED	1,2,3,4,6,7,8-HpCDF-13C	2.00	98	DN2
					1,2,3,4,7,8,9-HpCDF-13C	2.00	120	DN2
1,2,3,4,7,8-HxCDF	1200 J	—	18.0	D	1,2,3,4,6,7,8-HpCDD-13C	2.00	97	YDN2
1,2,3,6,7,8-HxCDF	740	—	18.0	D	OCDD-13C	4.00	51	YDN2
2,3,4,6,7,8-HxCDF	1400	—	18.0	D				
1,2,3,7,8,9-HxCDF	640	—	18.0	D	1,2,3,4-TCDD-13C	2.00	NA	
Total HxCDF	47000	—	360.0	DN2	1,2,3,7,8,9-HxCDD-13C	2.00	NA	
1,2,3,4,7,8-HxCDD	1300	—	18.0	D	2,3,7,8-TCDD-37Cl4	0.20	91	D
1,2,3,6,7,8-HxCDD	9800 J	—	18.0	ED				
1,2,3,7,8,9-HxCDD	2600	—	18.0	D				
Total HxCDD	62000 J	—	18.0	ED				
1,2,3,4,6,7,8-HpCDF	22000	—	360.0	DN2	Total 2,3,7,8-TCDD			
1,2,3,4,7,8,9-HpCDF	2200	—	360.0	DN2	Equivalence: 7300 ng/Kg			
Total HpCDF	85000	—	360.0	DN2	(Using ITE Factors)			
1,2,3,4,6,7,8-HpCDD	240000 J	—	360.0	EDN2				
Total HpCDD	370000 J	—	360.0	EDN2				
OCDF	150000	—	710.0	DN2				
OCDD	2200000 J	—	710.0	EDN2				

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NC = Not Calculated

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D = Result obtained from analysis of diluted sample
Nn = Value obtained from additional analysis
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FQO 7-22-16

REPORT OF LABORATORY ANALYSIS

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1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Sample Analysis Results

Client - PACE New Orleans

Client's Sample ID	SD-1		
Lab Sample ID	2038933009		
Filename	F160711A_10		
Injected By	BAL		
Total Amount Extracted	12.6 g	Matrix	Solid
% Moisture	20.3	Dilution	NA
Dry Weight Extracted	10.0 g	Collected	06/28/2016 10:30
ICAL ID	F160602	Received	06/30/2016 10:15
CCal Filename(s)	F160711A_01 & F160711A_18	Extracted	07/06/2016 17:50
Method Blank ID	BLANK-50948	Analyzed	07/11/2016 09:07

Native Isomers	Conc ng/Kg	EMPC ng/Kg	RL ng/Kg	Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	ND		1.00	2,3,7,8-TCDF-13C	2.00	79
Total TCDF	ND		1.00	2,3,7,8-TCDD-13C	2.00	90
				1,2,3,7,8-PeCDF-13C	2.00	80
2,3,7,8-TCDD	ND		1.00	2,3,4,7,8-PeCDF-13C	2.00	94
Total TCDD	ND		1.00	1,2,3,7,8-PeCDD-13C	2.00	91
				1,2,3,4,7,8-HxCDF-13C	2.00	77
1,2,3,7,8-PeCDF	ND		5.00	1,2,3,6,7,8-HxCDF-13C	2.00	79
2,3,4,7,8-PeCDF	ND		5.00	2,3,4,6,7,8-HxCDF-13C	2.00	80
Total PeCDF	ND		5.00	1,2,3,7,8,9-HxCDF-13C	2.00	74
				1,2,3,4,7,8-HxCDD-13C	2.00	75
1,2,3,7,8-PeCDD	ND		5.00	1,2,3,6,7,8-HxCDD-13C	2.00	66
Total PeCDD	ND		5.00	1,2,3,4,6,7,8-HpCDF-13C	2.00	71
				1,2,3,4,7,8,9-HpCDF-13C	2.00	80
1,2,3,4,7,8-HxCDF	ND		5.00	1,2,3,4,6,7,8-HpCDD-13C	2.00	88
1,2,3,6,7,8-HxCDF	ND		5.00	OCDD-13C	4.00	79
2,3,4,6,7,8-HxCDF	ND		5.00			
1,2,3,7,8,9-HxCDF	ND		5.00	1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	ND		5.00	1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	ND		5.00	2,3,7,8-TCDD-37Cl4	0.20	92
1,2,3,6,7,8-HxCDD	ND		5.00			
1,2,3,7,8,9-HxCDD	ND		5.00			
Total HxCDD	ND		5.00			
1,2,3,4,6,7,8-HpCDF	ND		5.00	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	ND		5.00	Equivalence: 0.21 ng/Kg		
Total HpCDF	ND		5.00	(Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	8.2		5.00			
Total HpCDD	16.0		5.00			
OCDF	ND		10.00			
OCDD	130.0		10.00			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
RL = Reporting Limit

ND = Not Detected
NA = Not Applicable
NC = Not Calculated

Results reported on a dry weight basis and are valid to no more than 2 significant figures.

KJP 7-21-16

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
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Method 8290 Sample Analysis Results

Client - PACE New Orleans

Client's Sample ID	FB-1		
Lab Sample ID	2038933010		
Filename	U160714B_04		
Injected By	BAL		
Total Amount Extracted	978 mL	Matrix	Water
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	06/28/2016 10:30
ICAL ID	U160204	Received	06/30/2016 10:15
CCal Filename(s)	U160714B_01 & U160714B_17	Extracted	07/08/2016 11:40
Method Blank ID	BLANK-50978	Analyzed	07/14/2016 15:18

Native Isomers	Conc pg/L	EMPC pg/L	RL pg/L	Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	ND		10	2,3,7,8-TCDF-13C	2.00	76
Total TCDF	ND		10	2,3,7,8-TCDD-13C	2.00	98
				1,2,3,7,8-PeCDF-13C	2.00	73
2,3,7,8-TCDD	ND		10	2,3,4,7,8-PeCDF-13C	2.00	70
Total TCDD	ND		10	1,2,3,7,8-PeCDD-13C	2.00	90
				1,2,3,4,7,8-HxCDF-13C	2.00	73
1,2,3,7,8-PeCDF	ND		51	1,2,3,6,7,8-HxCDF-13C	2.00	74
2,3,4,7,8-PeCDF	ND		51	2,3,4,6,7,8-HxCDF-13C	2.00	80
Total PeCDF	ND		51	1,2,3,7,8,9-HxCDF-13C	2.00	82
				1,2,3,4,7,8-HxCDD-13C	2.00	90
1,2,3,7,8-PeCDD	ND		51	1,2,3,6,7,8-HxCDD-13C	2.00	79
Total PeCDD	ND		51	1,2,3,4,6,7,8-HpCDF-13C	2.00	93
				1,2,3,4,7,8,9-HpCDF-13C	2.00	99
1,2,3,4,7,8-HxCDF	ND		51	1,2,3,4,6,7,8-HpCDD-13C	2.00	88 Y
1,2,3,6,7,8-HxCDF	ND		51	OCDD-13C	4.00	75 Y
2,3,4,6,7,8-HxCDF	ND		51			
1,2,3,7,8,9-HxCDF	ND		51	1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	ND		51	1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	ND		51	2,3,7,8-TCDD-37Cl4	0.20	97
1,2,3,6,7,8-HxCDD	ND		51			
1,2,3,7,8,9-HxCDD	ND		51			
Total HxCDD	ND		51			
1,2,3,4,6,7,8-HpCDF	ND		51	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	ND		51	Equivalence: 0.00 pg/L		
Total HpCDF	ND		51	(Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	ND		51			
Total HpCDD	ND		51			
OCDF	ND		100			
OCDD	ND		100			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
RL = Reporting Limit

ND = Not Detected
NA = Not Applicable
NC = Not Calculated

Y = Calculated using average of daily RFs

FYJ 7-21-16

REPORT OF LABORATORY ANALYSIS

ATTACHMENT B

Ecological Risk Evaluation Report, Ramboll Environ, February 2017

Prepared for

International Paper, Wiggins Mississippi

Document type

Draft

Date

February 2017

ECOLOGICAL RISK EVALUATION REPORT

INTERNATIONAL PAPER CLOSED FORMER WOOD TREATING UNITS

RAMBOLL ENVIRON

ECOLOGICAL RISK EVALUATION REPORT
INTERNATIONAL PAPER
CLOSED FORMER WOOD TREATING UNITS
WIGGINS, MS

Revision	**1**
Date	**February 2017**
Approved by	**Mary Sorensen**
Description	**Ecological Risk Evaluation**
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ACRONYMS AND ABBREVIATIONS

AhR	Aryl hydrocarbon receptor
ATSDR	Agency for Toxic Substances and Disease Registry
AUF	Area use factor
BCF	Bioconcentration factor
BSAF	Biota-sediment accumulation factor
BW	Body weight
COPEC	Constituents of potential ecological concern
CMS	Corrective Measures Study
CSM	Conceptual site model
DW	Dry weight
ED	Exposure duration
EPC	Exposure point concentration
ERA	Ecological risk assessment
ESV	Ecological screening value
FIR	Food ingestion rate
GEAEs	Generic ecological assessment endpoints
HQ	Hazard Quotients
IP	International Paper
IPaC	Information for Planning and Conservation
IR	Ingestion rate
LOAEL	Lowest observable effects level
mg/kg	milligrams per kilogram
mg/kg-BW-day	milligrams per kilogram of body weight per day
ng/kg	nanograms per kilogram
ng/kg-BW/day	nanograms per kilogram of body weight per day
NOAEL	No observable effects level
ORNL	Oak Ridge National Laboratory
PCDD/F	Polychlorinated dibenzo dioxins/furans
TCDD	2'3'7'8'-Tetrachlorodibenzodioxin
TDI	Total daily intake
TEF	Toxicity equivalency factor
TEQ	Toxicity equivalency quotient
TRV	Toxicity reference value
ug/kg	micrograms per kilogram
ug/kg-BW/day	micrograms per kilogram of body weight per day
USEPA	United States Environmental Protection Agency
USEPA R6	United States Environmental Protection Agency Region 6
USFWS	United State Fish and Wildlife Service

1 EXECUTIVE SUMMARY

This report documents the methodology and results of a screening ecological risk evaluation for the International Paper – Closed Former Wood Treating Site Units, South First Street, Wiggins, Mississippi, Stone County, HW Permit 980 600 084 (the Site). This analysis assesses potential ecological risks from potential historical discharges of polychlorinated dibenzo dioxins and furans (PCDD/Fs) from the facility into the adjacent creek, Church House Branch. This report follows United States Environmental Protection Agency (USEPA) ecological risk assessment guidance and reflects consultation with USEPA Region 4 staff. The results of the screening ecological risk evaluation presented in this report are consistent with the results discussed with USEPA on January 5, 2017.

The purpose of the screening ecological risk evaluation is to determine whether Site-related PCDD/Fs detected in the sediments of Church House Branch need further study to understand ecological risks at the Site, or if the current information is sufficient to determine the residual PCDD/Fs in sediment pose no unacceptable ecological risks. This risk evaluation considers wildlife receptors that are likely to be exposed to PCDD/Fs in Church House Branch and are expected to be the most highly exposed and sensitive among the wildlife species.

This screening risk evaluation evaluated the uptake of PCDD/Fs from the sediments of Church House Branch to the food web consumed by wildlife such as the green heron, the raccoon, and the marsh rice rat. This screening risk evaluation compared dietary exposure estimates to conservative (protective) dietary toxicity no effect and dietary low effect values. The results of this screening risk evaluation for the green herons, raccoons, and marsh rice rats collectively supports the conclusions that there are no unacceptable risks to mammal and bird populations that feed in Church House Branch and that no further ecological risk evaluation or action is warranted in Church House Branch at this time.

2 INTRODUCTION AND OVERVIEW

This report documents the methodology and results of a screening ecological risk evaluation for the International Paper – Closed Former Wood Treating Site Units, South First Street, Wiggins, Mississippi, Stone County, HW Permit 980 600 084 (the Site). This analysis assesses potential ecological risks from potential historical discharges of polychlorinated dibenzo dioxins and furans (PCDD/Fs) from the facility into the adjacent creek, Church House Branch. This report reflects consultation with United States Environmental Protection Agency (USEPA) Region 4 staff (Doug McCurry and Brett Thomas). International Paper and consultants met with USEPA via teleconference and in person on two occasions prior to the submittal of this report. Appendix A of this report provides the final set of ecological risk screening materials presented to and discussed with USEPA in January 2017.

This screening ecological risk evaluation is consistent with key elements of the following USEPA ecological risk assessment guidance:

- Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments Interim Final (USEPA 1997);
- Guidelines for Ecological Risk Assessment (1998);
- Generic Ecological Assessment Endpoints (GEAEs) for Ecological Risk Assessment (2003); and,
- Framework for Application of the Toxicity Equivalence Methodology for Polychlorinated Dioxins, Furans, and Biphenyls in Ecological Risk Assessment (2008).

The purpose of the screening ecological risk evaluation is to determine whether constituents from the Site need further study to understand ecological risks at the Site, or if the current information is sufficient to determine the Site poses no unacceptable ecological risks.

This report is organized as follows:

- Section 3: Problem Formulation
- Section 4: Exposure Assessment
- Section 5: Effects Assessment
- Section 6: Risk Characterization
- Section 7: Uncertainties
- Section 8: Discussion
- Section 9: References

3 PROBLEM FORMULATION

The problem formulation defines the reasons for conducting the screening ecological risk evaluation. Information pertaining to Site characterization, potential receptors, sources and effects of stressors, and ecosystem characteristics is vital to the problem formulation. The problem formulation provides the information used to establish the overall goals, breadth, and focus of a risk evaluation (USEPA 1997, USEPA 1998, USEPA Region 4 2015).

The problem formulation describes the environmental setting and habitat, proposes a conceptual site model that describes the relationships between stressors and the assessment endpoints, and discusses the potentially exposed receptors, detailing the assessment and measurement endpoints for the risk process. The remainder of this section presents the following components of the screening-level problem formulation:

- Environmental setting and habitat
- Current environmental conditions
- Threatened/endangered species present
- Contaminant fate and transport
- Contaminant mechanisms of ecotoxicity
- Conceptual site model and potentially exposed receptors
- Receptor parameters
- Assessment and measurement endpoints.

3.1 Environmental Setting and Habitat

This section describes the environmental setting at the Site, including topography, climate, demographics, land use, hydrology, geology, hydrogeology, surface water/drainage, groundwater use, background soil characterization, and the conceptual Site model for ecological exposures. This information is based upon information provided in the Preliminary Corrective Measures Study (CMS) Report for the Site (EarthCon 2005).

The Site is on the south side of Wiggins, Mississippi, approximately 30 miles inland from the coast of the Gulf of Mexico. It consists of an area of industrial hardscape, forested area, and a small creek. Church House Branch, a small creek, runs from north to south along the eastern side of the property. The creek includes some areas of palustrine, forested temporarily-or-seasonally-flooded wetlands. Most of the trees are broad-leafed deciduous trees. Figure 3-1 shows a general aerial photograph of the site, including Church House Branch sampling locations. Figure 3-2 shows the typical aquatic and nearshore environment along Church House Branch in the ponded area immediately upgradient of SD-2 (between SD-1 and SD-2).

Typical organisms present in the area include aquatic and terrestrial invertebrates. Small passerine birds can use the forest canopy for shelter and habitat, but larger raptors generally choose to hunt in open fields, and may not be particularly numerous here. Figure 3-3 shows the closed canopy of the forested area of Church House Branch. Figure 3-3A shows the closed canopy near the SW-2/SW-3 area. Figure 3-3B shows some terrestrial nearshore habitat near SD-7. Figure 3-3C shows some of the forest area near SD-6.

3.1.1 Church House Branch

According to the 2005 Preliminary CMS, Church House Branch is a small, first-order stream that originates in the southeastern portion of the City of Wiggins and flows southward approximately six miles to join Red Creek, a major tributary of the Black Creek system of the Pascagoula River

Drainage. Church House Branch is intermittent in the uppermost reach extending from the northern Wiggins facility property boundary to the stream's origin in Wiggins and is a perennial stream throughout most of its length from the Wiggins facility boundary to Red Creek.

The aquatic habitat within Church House Branch consists of transient beaver ponds, connected by discrete or braided stream channels of varying lengths, creating a mixture of lentic (sluggish or static) and lotic (flowing-water) water bodies that offer a wider variety of microhabitats within the overall reach than might otherwise be present near the headwaters of a first-order stream.

3.1.2 Plant Communities

A relatively flat riparian terrace, generally much narrower on the west, extends laterally to varying widths from the Church House Branch channel. This "bottomland" is a mixture of bottomland hardwood forest (shallow swamp where flooded) and emergent herbaceous communities (marshes), with some transitional strips of scrub-shrub vegetation (EarthCon 2005). Adjacent to the riparian zones on either side of Church House Branch are forested slopes, neither of which is particularly steep except in localized areas near the crest on the western (Wiggins facility) side. In contrast, the slope on the northeastern side of the stream is generally more gradual to, and beyond, the Wiggins facility property line. There is a broad swale, or secondary "valley," entering that of Church House Branch from the east around the latitude of the southernmost beaver pond, so that a large lobe of the pond spreads east-northeastward about halfway between the Church House Branch channel and the International Paper boundary. Another drainage pathway enters the Church House Branch valley from near the northeast comer of the property. This conveyance is represented, within International Paper property, by the remnant of a former tributary that appears to have been artificially channelized (straightened). Not far offsite, this stream has been dammed to create a farm pond (EarthCon 2005).

3.1.3 Animal Communities

The Preliminary CMS also describes the animal community (EarthCon 2005), as follows.

The Church House Branch riparian terrace and forested wetland (bottomland/swamp forest) create a relatively "natural," undisturbed, and secluded corridor in contrast to higher terrain which has been largely developed for industrial, commercial, transportation-related, silvicultural, agricultural (primarily grazing), and residential uses. Although no biological sampling was performed during the 2001 ecological reconnaissance or the 2004 Corrective Measures Study soil, sediment, and surface water sampling, observations by experienced biologists indicate that the stream and beaver ponds probably support resident populations of semi-aquatic and strictly aquatic animals typical of such habitats in the region. Mosquitofish, small sunfish, bullfrog and cottonmouth were observed in or near shallow, marginal, portions of the ponds. Based on the amount of emergent vegetation, periphyton, leaf litter, and other detrital material, a moderately diverse and productive benthic invertebrate community would be expected; especially in the littoral portions of the ponds, which are extensive since they encompass flooded former riparian areas.

The upland and wetland habitats of Church House Branch would be expected to support a diverse assemblage of resident and transient wildlife, and as expected, a diverse assemblage of herpetofauna (amphibians and reptiles), birds, and mammals. The Preliminary CMS reported that observed herpetofauna include: southern toad, green treefrog, southern cricket frog, bullfrog, box turtle, Mississippi mud turtle, slider turtle, garter snake, speckled kingsnake, eastern cottonmouth, and southern black racer. Avian species include: Merriam's turkey, turkey vulture, wood duck, great blue heron, redtailed hawk, blue jay, brown thrasher, loggerhead shrike, American crow, red-winged blackbird, and numerous other common small forest, woodland, and "edge" dwelling forms (e.g., chickadee, American robin, northern cardinal, and sparrows). The Preliminary CMS also states that it

is likely that a number of neotropical migrant songbirds, such as various warblers, utilize the area during spring and autumn migrations. Mammalian species recorded in the study area include: opossum, armadillo, beaver, gray squirrel, eastern cottontail (rabbit), raccoon, striped skunk, red fox, coyote, bobcat, and white-tailed deer.

3.1.4 Threatened or Endangered Species

A literature review of protected species that could potentially inhabit the Site was performed in association with this screening ecological risk evaluation. The US Fish and Wildlife Service's (FWS) Information Planning and Conservation System (iPAC) was used to identify which Federally-listed threatened or endangered species might occur near the Site (Appendix B). The federally-listed threatened and endangered species potentially occurring near the Site include (iPAC 2016):

- Red-cockaded Woodpecker *Picoides borealis* (endangered). Red-cockaded woodpeckers rely on mature longleaf or other pines for nesting. Preferred trees are generally over 80 years old (USFWS 2016a).
- Wood Stork *Mycteria americana* (threatened). Wood storks feed and roost in wetlands, particularly cypress or mangrove swamps. They congregate in freshwater marshes where fishes are concentrated by falling water (USFWS 2016b).
- Louisiana Quillwort *Isoetes louisianensis* (endangered). Mississippi populations of Louisiana Quill Wort are typically in shallow intermittent streams lined with black gum and laurel-leaf oak with sparse herbaceous groundcover (USFWS 2005).
- Black Pinesnake *Pituophis melanoleucus lodingi* (threatened) The Black Pinesnake generally inhabits fire-cleared pine forests with sandy, well-drained soil (USFWS 2016c).
- Gopher Tortoise *Gopherus polyphemus* (threatened). Gopher tortoises generally live in long-leaf pine or oak forests with dry sandy soil (USFWS 2016d).

The only federally-listed endangered, threatened, or candidate species for which appropriate habitat might be available in the vicinity of the study area are upland fauna with very specific vegetative cover requirements. These include: gopher tortoise, black pinesnake, and red-cockaded woodpecker. None of these particular habitats were observed in the aquatic and semi-aquatic areas near Church House Branch. Therefore, these species would not be exposed to PCDD/Fs in Church House Branch.

3.2 Contaminant Fate and Transport

The constituents of potential concern in Church House Branch are PCDD/Fs, which may have migrated from the Site adsorbed to soil particles.

3.3 Contaminant Mechanisms of Ecotoxicity

PCDD/Fs are mixtures of compounds that possess varying degrees of chlorination. The composition of commercial mixtures can be altered in the environment through processes such as chemical and biological transformation, volatilization, and preferential bioaccumulation. The more highly chlorinated congeners tend to adsorb strongly to soil and sediment and persist in the environment. In addition, these constituents bioaccumulate in the food chain and because of their stability and lipophilicity, are stored in fatty tissues. PCDD/Fs bind with the aryl hydrocarbon receptor (AhR) and have a common mechanism of toxicological action and are generally considered as a group (USEPA 2008). Only organisms that have an AhR are susceptible to toxicity from these constituents, and only higher vertebrates, such as fish, birds, and mammals have been shown to have this receptor (USEPA 2008). PCDD/Fs have limited, if any, effects on invertebrates because they do not have the AhR (USEPA 2008, West et al. 1997, Barber et al. 1998, Fuchsman et al. 2006). Additionally, these constituents have no adverse effects on plants because plants also lack an AhR (USEPA 2008).

Although the method of action is similar among these constituents, they vary in the extent that they can bond with this specific receptor to cause biological effects and they are frequently assessed in terms of their relative potency compared to 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (USEPA 2008). Dioxin-like PCDD/Fs are expressed in terms of toxicity equivalency quotients (TEQs), which is a quantity of 2,3,7,8-TCDD with the same, equivalent, toxicity. The TEQs are calculated by multiplying a toxicity equivalency factor (TEF) by the constituent concentrations. The TEFs used are from USEPA (2008).

PCDD/Fs are frequently associated with reproductive and developmental effects in early life stages (USEPA 2008). Effects that have been associated with high levels of exposure to PCDD/Fs in laboratory test animals include thyroid, liver, immunological alterations, neurodevelopmental changes, reproductive toxicity, reduced birth weight, dermal and ocular changes, and cancer (ATSDR 2000). Some PCDD/Fs, dioxins, and furans have “non-dioxin-like” effects and are not thought to act via binding to the AhR. These “non-coplanar” or “non-ortho-substituted” constituents may act through multiple pathways, and may have neurological, neuroendocrine, endocrine, immunological and carcinogenic effects (USEPA 2008).

3.4 Conceptual Site Model and Potentially Exposed Receptors

The potentially complete exposure pathways that are evaluated are illustrated in the ecological conceptual site model (CSM) in Figure 3-4. Overland surface runoff from the Site to Church House Branch is the transport mechanism. As was stated in Section 2.3, plants and invertebrates are relatively insensitive to PCDD/Fs. PCDD/F can bioconcentrate or bioaccumulate in organisms and move into higher-trophic level organisms through the food web, thus mammals and birds reflect the organisms most likely exposed and sensitive to PCDD/Fs. Mammals and birds can be exposed to constituents via ingestion of sediment and of organisms with bioaccumulative compounds in their tissues. Based on consultation with USEPA, the receptors chosen for this analysis are the green heron, the raccoon, and the marsh rice rat. Suitable habitat is present in the area for these species, these species are known to feed in environments similar to Church House Branch, and these species are considered sensitive to PCDD/Fs.

3.5 Assessment and Measurement Endpoints

Assessment endpoints are the ecological entities (e.g., populations of birds and mammals) and attributes (e.g., community diversity) that are to be protected (USEPA 1997, 2003). The selection of assessment endpoints depends on knowledge about the receiving environment, chemicals released (including ecotoxicological properties and concentrations that cause adverse impacts), and the values that will drive risk management decision-making (Suter et al. 1995).

The assessment endpoints considered for this Site are adverse effects to the populations of aquatic-oriented mammals and birds. Because direct measurement of assessment endpoints is often difficult (or impossible), measurement endpoints are used to provide the information necessary to evaluate whether the values associated with the assessment endpoint are being protected. A measurement endpoint is a measurable ecological characteristic and/or response to a stressor (USEPA 1998, 2003). Measurement endpoints, such as mortality, reproductive effects, and reduced growth are not directly measured. Rather, they are indirectly evaluated through the use of a dietary food web hazard quotient (HQ) approach. An HQ is the ratio of a chemical concentration to a conservative ecotoxicological exposure value relevant for the receptors being evaluated. Mammals and birds are evaluated via the comparison of modeled dietary intake of PCDD/Fs to doses reported in the literature as toxicity reference values (TRV) thresholds for adverse effects on survival or reproduction (“food web pathways”).

4 EXPOSURE ASSESSMENT

Exposure assessment is the process of measuring or estimating the magnitude, frequency, and duration of receptor exposures to constituents (USEPA 1992). For this Site, the exposure assessment is based on the life histories of the receptors of interest (the green heron, the raccoon, and the marsh rice rat) and how these receptors use and interact with the environment. This section identifies an exposure point concentration (EPC) for these receptors in the vicinity of the Site using a standard conservative food web model. The EPCs will then be integrated with the toxicity information developed in the next section in order to estimate the ecological risks associated with the Site.

4.1 Exposure Point Concentrations

Constituent exposures are estimated for green herons, raccoons, and marsh rice rats based on their exposure to constituents in their diet throughout their home range. These organisms are mobile and are exposed to constituents throughout their range at a variety of concentrations as they move up and down Church House Branch. Therefore, in order to appropriately model the extent to which they would interact with this stretch of Church House Branch, the entire Site data set (exclusive of background) is considered. Specifically, the average concentration of PCDD/F in Church House Branch (excluding background) is considered to be a conservative estimate of exposure because samples were collected from Church House Branch drainage channels in areas adjacent to drainage from the Site, reflecting the likely highest concentrations of Site-related PCDD/F present in Church House Branch. The average concentration was calculated assuming that constituents that were not detected were present at one-half the detection limit. Table 4-1 shows the sediment concentrations and the average concentration of the samples (excluding background).

4.2 Toxic Equivalents

Toxic Equivalents, or TEQs, are used to report the toxicity-weighted masses of mixtures of dioxins and furans. Within the TEQ method, each dioxin compound is assigned a toxic equivalency factor, or TEF. This factor denotes a given dioxin compound's toxicity relative to 2,3,7,8-tetrachlorobenzodioxin (TCDD), which is assigned the maximum toxicity designation of one. Other dioxin compounds are given equal or lower numbers, with each number roughly proportional to its toxicity relative to that of 2,3,7,8-TCDD. TEQs are relevant to birds or mammals. Regardless of which dioxin or furan is present, they can be represented by how toxic they are compared to TCDD. The PCDD/F TEQ is based on the 2005 World Health Organization toxicity effects factors for birds and mammals (Van den Berg et al. 1998 and 2006) and were also used in the USEPA's 2008 "Framework for Application of the Toxicity Equivalence Methodology for Polychlorinated Dioxins, Furans, and Biphenyls in Ecological Risk Assessment" guidance (USEPA, 2008). Table 4-1 provides the mammals and avian TEFs, presents the calculated TEQs for each location, and provides the average mammal and avian TEQs used in the dietary exposure calculations.

4.3 Uptake Into Food Items

The uptake calculations for bioaccumulation into plants, invertebrates, and fish used standard USEPA methods. A description of uptake calculations for these food items are provided below. Uptake equations are shown on Table 4-2 for each location, and the average of locations (excluding background). The approach for calculating uptake into food items described in this section was discussed in detail with USEPA as part of the communication associated with the development of this screening ecological risk evaluation.

4.3.1 Uptake Into Plants

Table 4-2 presents the USEPA Region 6 (R6) Uptake factor for plants where it is used to calculate estimated plant PCDD/F TEQ concentrations. USEPA Region 6 1999 (Appendix C, Table C-2) presents

bioconcentration factors (BCFs) for soil and sediment to plants. For 2,3,7,8-TCDD the BCF is calculated using a regression equation based on the octanol-water partitioning coefficient for TCDD (Kow). The BCFs for the rest of the dioxins and furans are based on the 2,3,7,8-TCDD BCF and an equivalency factor. Since these are BCFs, they are used to calculate the concentration in plants using the following equation:

$$C_{plant\ DW} = BCF \times C_{soil\ or\ sediment\ DW}$$

C plant dw = Concentration in plants in dry weight (ng/kg dw)

BCF = Bioconcentration factor (unitless)

C soil or sediment DW = Concentration in soil or sediment dry weight (ng/kg dw)

However, the receptor diets are in wet weight, so the concentration must be converted to wet weight. Plants are assumed to be 26% solids (USEPA, 1993, Wildlife Exposure Factors Handbook, Table 4-1). The dry weight is multiplied by 0.26 to convert to wet weight. Therefore plant concentrations are calculated like this:

$$C_{plant\ WW} = BCF \times C_{soil\ or\ sediment\ DW} \times Fraction\ Solids$$

C plant ww = Concentration in plants in wet weight (ng/kg ww)

BCF = Bioconcentration factor (unitless)

C soil or sediment DW = Concentration in soil or sediment dry weight (ng/kg dw)

Fraction Solids = the fraction of solid material in plants (unitless)

Once the concentrations in plant material are calculated, they are multiplied by the TEF from the USEPA (USEPA, 2008) to calculate the summed concentration in mammal and avian TEQs in plants from the dioxins.

4.3.2 Uptake into Invertebrates and Fish

Table 4-2 also presents biota sediment accumulation factors (BSAFs) for uptake of dioxins and furans from sediment to fish and the estimated values used for this ecological risk estimation. These BASFs were derived using the approach provided in USEPA 2008.

A BSAF is applied differently than a BCF. BSAFs describe the movement of strongly hydrophobic constituents in an aquatic environment, and their partitioning between organic carbon in the sediment and lipid in animals.

$$BSAF = \frac{C_{fish\ or\ invert\ DW} / f_{lipid}}{C_{sediment\ DW} / f_{organic\ carbon}}$$

C fish or invert DW = Concentration in fish or invertebrate dry weight (ng/kg dw)

F lipid = Fraction of the organism that is lipid (unitless)

C sediment = Concentration in sediment dry weight (ng/kg dw)

F organic carbon = Fraction of the soil that is organic carbon (unitless)

When this equation is rearranged to solve for the concentration in fish or invertebrate, it is:

$$C_{\text{fish or invert DW}} = \frac{C_{\text{sediment DW}}}{f_{\text{organic carbon}}} \text{ x BSAF x } f_{\text{lipid}}$$

C fish or invert DW = Concentration in fish or invertebrate dry weight (ng/kg dw)

F lipid = Fraction of the organism that is lipid (unitless)

C sediment DW = Concentration in sediment dry weight (ng/kg dw)

F organic carbon = Fraction of the soil that is organic carbon (unitless)

A fish lipid fraction of 5 percent was used to represent the communities of small forage fishes at this Site. The value of 5 percent is considered an upper estimate of fish lipids because Church House Branch is a relatively small aquatic system that is not likely to support large, fat fish. Many fish are likely to have lower lipid levels, and thus accumulate less PCDD/Fs.

An invertebrate lipid fraction of 1.6 percent was used based on a study of a variety of invertebrates (Morrison et al. 1996).

The fraction of organic carbon is estimated as the average of organic carbon concentrations in sediment. The average concentration of organic carbon was 15,560 mg/kg, or 15.6 percent, which is a fractional value of 0.156.

The receptor diets are in wet weight, so the concentration must be converted to wet weight. Fish are assumed to be 29 percent solids and invertebrates are assumed to be 21 percent solids (USEPA, 1993, Wildlife exposure factors handbook, Table 4-1). The dry weight is multiplied by 0.29 or 0.21 to convert to wet weight. Therefore, fish and invertebrate concentrations are calculated by:

$$C_{\text{fish or invert WW}} = \frac{C_{\text{sediment DW}}}{f_{\text{organic carbon}}} \text{ x BSAF x } f_{\text{lipid}} \text{ x Fraction Solids}$$

C fish or invert WW = Concentration in fish or invertebrate wet weight (ng/kg ww)

F lipid = Fraction of the organism that is lipid (unitless)

C sediment DW = Concentration in sediment dry weight (ng/kg dw)

F organic carbon = Fraction of the soil that is organic carbon (unitless)

Fraction Solids = the fraction of solid material in fish or invertebrates (unitless)

Once the dioxin concentrations in invertebrate and fish tissue are calculated, they are multiplied by the TEF from the USEPA (USEPA, 2008) to calculate the summed concentration in mammal and avian TEQs in invertebrate and fish tissue from the dioxins.

4.4 Receptor Parameters

Receptor parameters are provided on Table 4-3. Where possible, conservative assumptions were made, as discussed below. Most of the wildlife receptor parameters are from the USEPA's 1993 Wildlife Exposures Handbook (USEPA, 1993) or Oak Ridge National Lab's 1994 Methods and Tools for Estimation Of The Exposure Of Terrestrial Wildlife To Contaminants guidance. Some parameters for marsh rice rats were taken from primary literature (Davis and Schmidly, 1994; Wolfe, 1982). Body weights were used to calculate the ingestion rate of food using standard allometric equations (USEPA

1993). The proportion of each food item in the receptor diets was extrapolated from values in the literature (USEPA 1993, ORNL 1994, Davis and Schmidly, 1994), combined with best professional judgement given the available habitat and food items at the Site.

4.4.1 Sediment Ingestion Rates

Sediment ingestion is an important pathway for exposure at the Site. The ingestion rate of sediment for green herons is listed as negligible (ORNL 1994), however, in order to be appropriately conservative, the model uses a sediment ingestion rate of 2%. While Beyer, 1994 shows an ingestion rate for sediment in raccoons as 9%, that value should be considered overly conservative and uncertain because the study is based on the diets of only four individual raccoons that were feeding primarily on soil organisms in Minnesota. Raccoons are opportunistic feeders, and their habitat/geography is the prime determinant of their dietary choices (Rulison 2012). The soil ingestion preferences from a widely separate population may not be directly applicable to this Wiggins Site, where raccoons are likely feeding on frogs and crayfish typical of Church House Branch. In addition, raccoons do not feed entirely on sediment dwelling organisms, so they may feed on organisms that are not impacted by the Site. In fact, USEPA 1993 lists 20 studies that detail raccoon diet. Six of the studies listed in USEPA 1993 (Alexander 1977, Dorney 1954, Hamilton 1940, Schoonover and Marshall 1951, Tabatabai and Kennedy 1988, Tester 1953) list either trace or no consumption of earthworms and insects - which would have dramatically lower incidental soil ingestion from these organisms. In order to try and understand this uncertainty, 9% soil ingestion by raccoons is considered an overly conservative maximum value, and a soil ingestion rate as low as 5% is considered. A sediment ingestion value for marsh rice rats is not provided in the USEPA Wildlife Exposure Factors Handbook. Beyer 1994 lists a value of less than 2 percent for white-footed mice, so sediment ingestion rate values between 0 and 1% were used for marsh rice rats.

4.4.2 Area Use Factors and Exposure Durations

The area use factor (AUF) represents how much of the animal's normal range is taken up by the Site. Green herons and marsh rice rats are small home range species. This screening risk evaluation conservatively assumes they live solely at the Site, and feed every day for their entire lives in the small area characterized by the sediment samples. This is a conservative assumption because there is ample habitat for both of these organisms throughout Church House Branch, and there is nothing unique or special about the area near the Site that makes it particularly attractive for these individual birds and mice.

Raccoon home range was calculated as the average of 30 values from 8 studies given in USEPA 1993. Raccoons have a home range between 2 and 2,000 acres, and the average value was 265 hectares, or 655 acres. Using the conservative assumption that the constituents at the Site influence an area of 20 acres (shown on Figure 4-1), equates to approximately 3 percent of a raccoon's home range. In order to model an appropriately realistic raccoon exposure, the AUF for raccoons is 0.03. There is no evidence to indicate that the site influence extends to cover a 20-acre area – it is merely a conservative assumption.

For the 20-acre tract that surrounds the three sampling points in Church House Branch, it would be appropriate to mention that the three samples were taken in the main channel of the Branch. This reflects where the highest concentrations of PCDD/Fs via stormwater runoff would likely deposit and concentrate in the sediment channel. These three samples are considered very conservatively to characterize the entirety of that 20-acre area, and, in reality, likely represent a very small fraction of the 20 acre area. For this reason, the average concentration for these three samples very likely exceeds the average concentration for the entire 20 acres, and hence represents a conservative "worse-case scenario".

The exposure duration (ED) is the percentage of the animal's time it is expected to spend in the area in order to account for migration. Raccoons and marsh rice rats are year-round residents of the Site, so their ED is assumed to be 1. Green herons are known to migrate between breeding grounds in the US during the summer and wintering grounds in Mexico in the spring (Audubon Society, 2016; Cornell Lab of Ornithology, 2016). However, some birds in habitat close to the Gulf of Mexico may be year round residents. In order to be conservative, the birds at the site are considered year round residents and also have an ED of 1.

4.5 Total Daily Intake

The average concentrations are used in the food web to estimate concentrations in the plants, fish, and invertebrates that green herons, raccoons and marsh rice rats may eat from Church House Branch (i.e., food web exposures). The food web estimates are referred to as a total daily intake (TDI) for each constituent, as described below. Table 4-4 shows the calculations of TDI for each location and for the average value for the Site (excluding background) for a range of sediment concentrations (end of Table 4-4).

TDIs are calculated, based on the methodology described by EPA (USEPA 1993). TDI are estimated as a function of the AUF, ED, ingestion rate of sediment, the concentration of TEQs in sediment, the ingestion rate of food, the dietary items, and body weight. The output of this equation is the concentration of TEQs consumed by each receptor in units of milligram per kilogram of body weight per day (mg/kg-BW-day).

Dietary intakes are calculated for green herons, raccoons, and marsh rice rats using the following equation (USEPA 1993, ORNL 1994):

$$\text{Total Daily Intake} = \text{AUF} \times \text{ED} \times \left[\frac{IR_{sediment} \times C_{sediment} + IR_{food} \times \sum \left(FIR_{food\,item} \times C_{food\,item} \right)}{BW} \right]$$

Where:

Total Daily Intake	= Oral intake of PCDD/F in diet (mg/kg-d)
AUF	= Area Use Factor (unitless percentage) (literature)
ED	= Exposure Duration (unitless percentage) (literature)
IRsediment	= Ingestion rate (kg fresh weight of sediment/individual/day) (literature)
Csediment	= Concentration of PCDD/F in sediment (mg /kg sediment) (measured)
IRfood	= Ingestion rate (kg fresh weight of food/individual/day) (literature)
FIRfooditem	= Fractional ingestion rate of a food item (unitless percentage) (literature)
Cfooditem	= Concentration of PCDD/F in a food item (mg /kg fresh weight) (calculated)
BW	= Body weight (kg) (literature)

5 EFFECTS ASSESSMENT

The effects assessment for wildlife is based on TRVs that relate the TDI to ecotoxicological endpoints for survival, growth, and reproductive endpoints. TRVs are literature-derived concentrations or doses, below which adverse effects are unlikely (e.g., Sample 1996). No observed adverse effect level (NOAEL) TRVs are indicative of doses of constituents that have had no deleterious effects on a wildlife receptor. Lowest observed adverse effect level (LOAEL) TRVs are the minimum doses of constituents where deleterious effects are apparent. Table 5-1 lists the TRVs used for this analysis. Both TRVs are compared against the TDIs which provides two scenarios:

- Average EPC versus NOAEL TRV
- Average EPC versus LOAEL TRV.

The toxicity reference values (TRVs) used in the screening ecological risk evaluation are summarized in Table 5-1.

5.1 Derivation of Avian TRVs

The avian NOAEL and LOAEL were obtained from Nosek et al. 1992, which is the same source used by ORNL 1996. The Nosek et al. paper says that:

- 0.1 ug/kg BW/wk TCDD administered over 10 weeks has no effect
- 1.0 ug/kg BW/wk TCDD administered over 10 weeks has an effect.

The NOAEL values were converted to ng/kg-BW/day, as follows (LOAEL values were converted similarly):

- 0.1 µg/kg -BW/week
- Divide by 7 days
- 0.0143 µg/kg-BW/day
- Times 1,000
- 14 ng/kg-BW/day

A similar approach, when applied to the concentration that has effect results in a LOAEL value of 140 ng/kg-BW-day. USEPA requested that a LOAEL value of 64 ng/kg-BW/day be used as the LOAEL TRV based up the USEPA Region 4 review of the Nosek study. As an uncertainty evaluation, the TRV of 140 ng/kg-BW/day (from Nosek et al., 1992 and as cited in Sample et al. 1996) was used to understand an additional range of toxicity information.

5.2 Derivation of Mammal TRVs

The mammal NOAEL and LOAEL for rats from Sample et al. (1996) were used. These are from a study that exposed rats to TCDD over three generations (Murray 1979). This study showed no significant differences at a dose equivalent to 1 ng/kg-BW/day (the NOAEL). There were some effects on fertility, litter size, gestation survival, postnatal survival, and postnatal body weight at the dose equivalent to 10 ng/kg-BW/day (the LOAEL). The rat study is considered the most appropriate study for the evaluation of potential risks to the marsh rice rat.

Additional TRVs were obtained from Moore et al. 2012 and Zwiernik et al. 2009. The Moore et al. 2012 and Zwiernik et al. 2009 studies are appropriate for the Wiggins Site ecological risk evaluation because mink is phylogenetically more similar to the raccoon than a rat. These studies are newer than the Sample 1996 document, and were not part of that compilation.

Sample et al. (1996), rat study:

- In the Murray et al. 1979 rat study, rats were fed chow amended with TCDD.
- The rats were followed for three generations, while constantly maintained on this diet.
- Some rats were sacrificed and examined for gross histopathology.
- Reproductive endpoints were recorded through the study.
- This study showed a NOAEL of 1 ng/kg-BW/day and a LOAEL of 10 ng/kg-BW/day.

Moore et al. (2012), mink study:

- Mean body mass of male juvenile mink exposed to 8.4 ng/kg BW/d diet was less than the control at week 14, but by week 27 mass was no longer different.
- Mean spleen mass of adult female mink and juvenile male mink exposed to 8.4 ng/kg BW/d diet was significantly greater than the control.
- Mean relative adrenal gland mass of juvenile female mink exposed to 8.4 ng/kg BW/d diet was significantly greater than the control.
- Despite these relatively minor anatomical changes, doses of TCDD as high as 8.4 ng/kg BW/d had no significant effect on reproductive performance of mink or viability of their offspring.
- The value of 8.4 ng/kg BW/d was chosen as the NOAEL.

Zwiernik et al. (2009), mink study:

- The constituents used were generally furans, but the constituents were measured in TEQ. Therefore, this makes the study widely relevant to other constituents measured in TEQs.
- In the field study, there were no statistically significant differences in any of the measured parameters between mink exposed to a dietary dose of 31 ng/kg BW/day and mink from an upstream reference area.
- No statistically significant differences or adverse effects were observed for any of the measurement endpoints, including squamous epithelial cell proliferation, the most sensitive endpoint examined, even though mink inhabiting the Tittabawassee River are exposed to a median predicted dietary concentration of 31 ng/kg-BW/day.
- In fact, based on the results of the field study, a dietary NOAEL of >31 ng/kg-BW/day would be justified for chronic exposure.
- However, given that this value is higher than the value in the Moore et al. (2012) study, 31 ng/kg-BW/day was chosen as a conservative LOAEL, rather than a NOAEL.

As part of the conservative evaluation of risks for the raccoon, and at the direction of the USEPA, the Murray et al. rat study was used to evaluate potential risks to the raccoon. In addition, as part of an uncertainty evaluation, the mink studies were also used as part of the risk evaluation for the raccoon.

6 RISK CHARACTERIZATION

Risk characterization begins with the mathematical comparison of exposure and effects estimates for each measurement endpoint, reflected as the unitless HQ as follows:

$$\text{Hazard Quotient} = \frac{\text{TDI}}{\text{TRV}}$$

HQs less than or equal to the threshold value of 1 (to one significant figure) indicate that the constituents do not pose an unacceptable risk. HQs that exceed the threshold value of 1 indicate a potentially unacceptable risk, although closer consideration may be needed to understand whether or not this is the case (e.g., the magnitude of the HQ and the spatial distribution of elevated HQs must be considered). Similar considerations must also be given to understand potential risks for bird and mammal populations. For example, in addition to the HQ value itself, the basis of the TRV must be considered. HQs greater than 1 based on a LOAEL are more significant than HQs greater than 1 for a NOAEL, in terms of potential population-level effects. Consideration of both the NOAEL and LOAEL HQs provides insight into the uncertainty in the risk characterization for birds and mammals.

Table 6-1 provides the results of the risk calculations. Figure 6-1 provides an illustration of the dietary components that comprise the HQ. The following observations are made for the green heron, the raccoon, and the marsh rice rat.

- **Green Heron:** NOAEL and LOAEL HQs are less than 1. These HQs support the conclusion that the PCDD/F concentrations detected in the sediments of Church House Branch do not pose unacceptable risks to individual green herons or other small home range fish and sediment invertebrate eating birds. As such, there are no unacceptable risks expected for the bird populations that feed in Church House Branch.
- **Raccoon:** All raccoon LOAEL HQs are less than 1 regardless of the amount of sediment ingested and considering the most conservative Murray et al. rat TRV. The raccoon NOAEL HQs range from less than 1 to a maximum HQ of 2 using the Murray rat TRV and assuming the maximum sediment ingestion of 9 percent. The mink TRV, provided as part of an uncertainty evaluation, shows that both NOAEL and LOAEL HQs are less than 1, even assuming the maximum sediment ingestion of 9 percent. These HQs support the conclusion that the PCDD/F concentrations detected in the sediments of Church House Branch do not pose unacceptable risks to individual raccoons or raccoon populations.
- **Marsh Rice Rat:** All marsh rate rat LOAEL HQs are less than or equal to 1. The HQs for the marsh rice rate range from less than 1 to 10 depending on the amount of sediment ingested by the rat during feeding. The data from Table 4-4, when graphically presented on Figure 6-1, illustrates that approximately 95 percent of the HQ for the marsh rice rat comes from the direct ingestion of sediment rather than from food web exposures. Yet, the TRV is based on dietary exposure, assuming that all of the sediment PCDD/Fs can be digested and is available to exert some toxic response from the rice rat, which is not likely. Based on these results, some potential risks to some individual rice rats cannot be definitively ruled out at this time. However, the results indicate that the PCDD/Fs present do not pose unacceptable risks to the rice rat populations that feed in Church House Branch.

Collectively, results support the conclusions that there are no unacceptable risks to mammal and bird populations that feed in Church House Branch and that no further ecological risk evaluation or action is warranted in Church House Branch at this time.

7 UNCERTAINTIES

The characterization of uncertainty is a key component of the risk analysis (USEPA 1997). This section provides a narrative discussion of the types of uncertainties that may influence the results. Uncertainty in a risk evaluation represents "the imperfect knowledge concerning the present or future state of the system under consideration; a component of risk resulting from imperfect knowledge of the degree of hazard, or of its spatial and temporal distribution" (USEPA 1997).

Quantitative evaluation of ecological risks is frequently limited by uncertainty regarding data, exposure, toxicity, and risk issues. Uncertainties that may lead to either an overestimation or an underestimation of risk are associated with each stage of risk assessment. Food web modeling involves a wide range of uncertainties pertaining to input exposure and effects parameters. This risk evaluation conservatively overestimates the exposure and risk estimates. Below is a summary of some of the key uncertainties.

7.1 Uncertainties in the Exposure Assessment

- An uncertainty is the uptake into food items. While trusted USEPA sources were used for the generic uptake factors, they may not account for Site-specific conditions and are based on organisms at other sites. The plants, invertebrates, and fish here could have slightly different physiology that could either increase or decrease their uptake or assimilation of TEQs. Site-specific organic carbon values were used, which provides the most realistic estimate of exposure available. In addition, a higher amount of fish lipids than expected was used, leading to conservative uptake estimates for fish diet parameters.
- The food web model assumes that 2 percent of the green heron diet is sediment. Although the best resources for food web models (USEPA 1993, ORNL 1994) indicate that sediment is not a part of the diet of great blue herons, and given that there is no information on sediment consumption of green herons, adding in consumption of sediment for green herons at 2 percent allows for some direct exposure as well as an added element of conservatism.
- The food web model assumes sediment ingestion of 5 to 9 percent for the raccoon and 0 to 1 percent for the marsh rice rat. This allows an understanding of the range of potential risk estimates. This was provided to quantify some of the uncertainty in the risk evaluation. As can be seen on Figure 6-1, the direct ingestion of sediment is the primary contribution to the HQs for all three species. The TRVs are based on ingestion and dietary absorption of PCDD/Fs. It is very conservative to assume that PCDD/Fs in sediment are digested in a manner similar to food, and thus comparison to dietary TRVs overestimates potential risk.
- The wildlife receptors used in this risk evaluation are considered likely to be the most exposed and most sensitive of the types of wildlife that may be present in Church House Branch.

7.2 Uncertainties in the Effects Assessment

- The TRVs are generic, and not site specific. While this analysis uses a raccoon, there is no TRV for raccoons, so a rat and a mink TRV are used as surrogates. The TRV for birds comes from a pheasant chick study, which are different than green herons. It is entirely appropriate to use these sorts of surrogates, but it does introduce uncertainty into the analysis.

7.3 Uncertainties in the Risk Characterization

- There are uncertainties associated with interpreting individual versus population level impacts using HQs. HQs provide some insight into the types of impacts an individual organism may experience when exposed to chemicals, but they do not provide insight into population impacts (Barnthouse et al. 2007).

8 CONCLUSIONS

The results of this screening evaluation are consistent with the results discussed with USEPA on January 5, 2017. The purpose of the screening ecological risk evaluation was to determine whether Site-related PCDD/Fs detected in the sediments of Church House Branch need further study to understand ecological risks at the Site, or if the current information is sufficient to determine the residual PCDD/Fs in sediment pose no unacceptable ecological risks. This risk evaluation considered wildlife receptors likely to be exposed to PCDD/Fs in Church House Branch and those expected to be the most highly exposed and sensitive among the wildlife species, such as the green heron, the raccoon, and the marsh rice rat. This screening risk evaluation estimated the uptake of PCDD/Fs from the sediments of Church House Branch to the food web consumed by the green heron, the raccoon, and the marsh rice rat. Dietary exposure estimates were compared to conservative (protective) dietary toxicity no effect and dietary low effect values. The results of the screening risk evaluation is provided in the form of HQs, where HQs less than or equal to 1 indicate no unacceptable risks. The risk evaluation showed that all low effect HQs for all species were less than or equal to 1, even using the most conservative toxicity values and most conservative estimates of sediment ingestion. The no effect HQs were less than 1 for the green heron. The no effect HQs for the raccoon were all less than 1 except at the highest sediment ingestion estimate, and even so the maximum HQ was 2, only slightly exceeding the threshold value of 1. The marsh rice rat no effect HQs ranged from less than 1 to a maximum of 10, which indicates that some potential risks to some individual marsh rice rats cannot be definitively ruled out. However, given the conservative exposure assumptions made in this screening risk evaluation and considering the no effect and low effect HQs for the green herons, raccoons, and marsh rice, the available information collectively supports the conclusions that there are no unacceptable risks to mammal and bird populations that feed in Church House Branch. Therefore, no further ecological risk evaluation or action is warranted in Church House Branch at this time.

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TABLES

Table 4-1 Calculation of Mammalian and Avian TEQs
International Paper, Inc. - Former Wood Treating Site
Wiggins, Mississippi

				SD-1 (Background)			SD-3			SD-5			SD-5 FD or SD-6			SD-7			AVERAGE		
Sediment		WHO Mammal TEF	Avian TEF	Conc.	Mammal TEQs	Avian TEQs	Conc.	Mammal TEQs	Avian TEQs	Conc.	Mammal TEQs	Avian TEQs	Conc.	Mammal TEQs	Avian TEQs	Conc.	Mammal TEQs	Avian TEQs	AVERAGE Conc.	Mammal TEQs	Avian TEQs
1,2,3,4,6,7,8-HpCDD	ng/kg	0.01	0.001	8.2	0.082	0.0082	240,000 J	2,400	240	94,000	940	94	88,000	880	88	45,000	450	45	116,800	1,168	116.8
1,2,3,4,6,7,8-HpCDF	ng/kg	0.01	0.01	5 U	0.025	0.025	22,000	220	220	14,000	140	140	16,000	160	160	8,100	81	81	15,030	150.3	150.3
1,2,3,4,7,8,9-HpCDF	ng/kg	0.01	0.01	5 U	0.025	0.025	2,200	22	22	1,400	14	14	1,800	18	18	1,000	10	10	1,600	16	16
1,2,3,4,7,8-HxCDD	ng/kg	0.1	0.05	5 U	0.25	0.125	1,300	130	65	600	60	30	660	66	33	300	30	15	715	71.5	35.75
1,2,3,4,7,8-HxCDF	ng/kg	0.1	0.1	5 U	0.25	0.25	1,200 J	120	120	530	53	53	600	60	60	280	28	28	652.5	65.25	65.25
1,2,3,6,7,8-HxCDD	ng/kg	0.1	0.01	5 U	0.25	0.025	9,800 J	980	98	3,300	330	33	3,400	340	34	1,300	130	13	4,450	445	44.5
1,2,3,6,7,8-HxCDF	ng/kg	0.1	0.1	5 U	0.25	0.25	740	74	74	440 J	44	44	470 J	47	47	250 J	25	25	475	47.5	47.5
1,2,3,7,8,9-HxCDD	ng/kg	0.1	0.1	5 U	0.25	0.25	2,600	260	260	1,500	150	150	1,600	160	160	720	72	72	1,605	160.5	160.5
1,2,3,7,8,9-HxCDF	ng/kg	0.1	0.1	5 U	0.25	0.25	640	64	64	190	19	19	210	21	21	77	7.7	7.7	279.3	27.93	27.93
1,2,3,7,8-PeCDD	ng/kg	1	1	5 U	2.5	2.5	270	270	270	200	200	200	220	220	220	89	89	89	194.8	194.8	194.8
1,2,3,7,8-PeCDF	ng/kg	0.03	0.1	5 U	0.075	0.25	150 J	4.5	15	68	2.04	6.8	70	2.1	7	25 U	0.375	1.25	75.13	2.254	7.513
2,3,4,6,7,8-HxCDF	ng/kg	0.1	0.1	5 U	0.25	0.25	1,400	140	140	730	73	73	850	85	85	390	39	39	842.5	84.25	84.25
2,3,4,7,8-PeCDF	ng/kg	0.3	1	5 U	0.75	2.5	810	243	810	180	54	180	180	54	180	84	25.2	84	313.5	94.05	313.5
2,3,7,8-TCDD	ng/kg	1	1	1 U	0.5	0.5	47	47	47	13	13	13	14	14	14	10	10	10	21	21	21
2,3,7,8-TCDF	ng/kg	0.1	1	1 U	0.05	0.5	82	8.2	82	15	1.5	15	14	1.4	14	6.8	0.68	6.8	29.45	2.945	29.45
OCDD	ng/kg	0.0003	0.0001	130	0.039	0.013	2,200,000 J	660	220	800,000 J	240	80	870,000 J	261	87	390,000 J	117	39	1,065,000	319.5	106.5
OCDF	ng/kg	0.0003	0.0001	10 U	0.0015	0.0005	150,000	45	15	46,000	13.8	4.6	53,000	15.9	5.3	34,000	10.2	3.4	70,750	21.23	7.075
TEQ	ng/kg				5.80	7.72		5,688	2,762		2,347	1,149		2,405	1,233		1,125	569		2,891	1,428

Average The average concentration is calculated excluding the background sample (SD-1). Constituents that were not detected are assumed to be present at 1/2 the detection limit. The average concentration, and the TEQs calculated from it, are shown with only four significant digits for presentation purposes, but the full precision was kept through the following calculations.
ng/kg Nanograms per kilogram
mg/kg Milligrams per kilogram
U Not detected
J Concentration estimated.
SD-5 FD Note that SD-5 FD is a field duplicate of sample SD-5. It is also called SD-6.
WHO World Health Organization.
TEF Toxicity equivalency factor.
TEQ Toxic equivalents.

Table 4-2 Uptake into Food Items
International Paper, Inc. - Former Wood Treating Site
Wiggins, Mississippi

Sediment	SD-1 ng/kg dw (6/28/2016)	R6 Uptake factor for plants (DW)	Plant conc ng/kg ww	BSAF (USEPA 2008)	Invert conc ng/kg ww	Fish conc ng/kg ww	WHO/ USEPA Mammal TEF	Plant Mammalian TEQ ng/kg ww	Invert Mammalian TEQ ng/kg ww	Fish Mammalian TEQ ng/kg ww	WHO/ USEPA Avian TEF	Plant Avian TEQ ng/kg ww	Invert Avian TEQ ng/kg ww	Fish Avian TEQ ng/kg ww
1,2,3,4,6,7,8-HpCDD	8.20E+00	2.90E-04	6.18E-04	8.00E-03	1.41E-03	6.10E-03	1.00E-02	6.18E-06	1.41E-05	6.10E-05	1.00E-03	6.18E-07	1.41E-06	6.10E-06
1,2,3,4,6,7,8-HpCDF	2.50E+00	6.20E-05	4.03E-05	1.00E-03	5.38E-05	2.32E-04	1.00E-02	4.03E-07	5.38E-07	2.32E-06	1.00E-02	4.03E-07	5.38E-07	2.32E-06
1,2,3,4,7,8,9-HpCDF	2.50E+00	2.20E-03	1.43E-03	3.00E-02	1.62E-03	6.97E-03	1.00E-02	1.43E-05	1.62E-05	6.97E-05	1.00E-02	1.43E-05	1.62E-05	6.97E-05
1,2,3,4,7,8-HxCDD	2.50E+00	1.70E-03	1.11E-03	3.00E-02	1.62E-03	6.97E-03	1.00E-01	1.11E-04	1.62E-04	6.97E-04	5.00E-02	5.53E-05	8.08E-05	3.49E-04
1,2,3,4,7,8-HxCDF	2.50E+00	4.30E-04	2.80E-04	1.00E-02	5.38E-04	2.32E-03	1.00E-01	2.80E-05	5.38E-05	2.32E-04	1.00E-01	2.80E-05	5.38E-05	2.32E-04
1,2,3,6,7,8-HxCDD	2.50E+00	6.70E-04	4.36E-04	2.00E-02	1.08E-03	4.65E-03	1.00E-01	4.36E-05	1.08E-04	4.65E-04	1.00E-02	4.36E-06	1.08E-05	4.65E-05
1,2,3,6,7,8-HxCDF	2.50E+00	1.10E-03	7.15E-04	1.00E-02	5.38E-04	2.32E-03	1.00E-01	7.15E-05	5.38E-05	2.32E-04	1.00E-01	7.15E-05	5.38E-05	2.32E-04
1,2,3,7,8,9-HxCDD	2.50E+00	7.80E-04	5.07E-04	2.00E-02	1.08E-03	4.65E-03	1.00E-01	5.07E-05	1.08E-04	4.65E-04	1.00E-01	5.07E-05	1.08E-04	4.65E-04
1,2,3,7,8,9-HxCDF	2.50E+00	3.50E-03	2.28E-03	4.00E-02	2.15E-03	9.29E-03	1.00E-01	2.28E-04	2.15E-04	9.29E-04	1.00E-01	2.28E-04	2.15E-04	9.29E-04
1,2,3,7,8-PeCDD	2.50E+00	5.20E-03	3.38E-03	1.80E-01	9.69E-03	4.18E-02	1.00E+00	3.38E-03	9.69E-03	4.18E-02	1.00E+00	3.38E-03	9.69E-03	4.18E-02
1,2,3,7,8-PeCDF	2.50E+00	1.10E-03	7.15E-04	1.00E-02	5.38E-04	2.32E-03	3.00E-02	2.15E-05	1.62E-05	6.97E-05	1.00E-01	7.15E-05	5.38E-05	2.32E-04
2,3,4,6,7,8-HxCDF	2.50E+00	3.80E-03	2.47E-03	5.00E-02	2.69E-03	1.16E-02	1.00E-01	2.47E-04	2.69E-04	1.16E-03	1.00E-01	2.47E-04	2.69E-04	1.16E-03
2,3,4,7,8-PeCDF	2.50E+00	9.00E-03	5.85E-03	3.30E-01	1.78E-02	7.67E-02	3.00E-01	1.76E-03	5.33E-03	2.30E-02	1.00E+00	5.85E-03	1.78E-02	7.67E-02
2,3,7,8-TCDD	5.00E-01	5.60E-03	7.28E-04	2.00E-01	2.15E-03	9.29E-03	1.00E+00	7.28E-04	2.15E-03	9.29E-03	1.00E+00	7.28E-04	2.15E-03	9.29E-03
2,3,7,8-TCDF	5.00E-01	4.50E-03	5.85E-04	1.20E-01	1.29E-03	5.58E-03	1.00E-01	5.85E-05	1.29E-04	5.58E-04	1.00E+00	5.85E-04	1.29E-03	5.58E-03
OCDD	1.30E+02	6.70E-05	2.26E-03	5.00E-04	1.40E-03	6.04E-03	3.00E-04	6.79E-07	4.20E-07	1.81E-06	1.00E-04	2.26E-07	1.40E-07	6.04E-07
OCDF	5.00E+00	9.00E-05	1.17E-04	1.00E-03	1.08E-04	4.65E-04	3.00E-04	3.51E-08	3.23E-08	1.39E-07	1.00E-04	1.17E-08	1.08E-08	4.65E-08
Mammalian TEQ	5.80E+00	5.60E-03	8.44E-03	2.00E-01	2.50E-02	1.08E-01	NA	6.74E-03	1.83E-02	7.91E-02	NA	NA	NA	NA
Avian TEQ	7.72E+00	5.60E-03	1.12E-02	2.00E-01	3.33E-02	1.44E-01	NA	NA	NA	NA	NA	1.13E-02	3.18E-02	1.37E-01

Table 4-2 Uptake into Food Items
International Paper, Inc. - Former Wood Treating Site
Wiggins, Mississippi

Sediment	SD-3 ng/kg dw (6/28/2016)	R6 Uptake factor for plants (DW)	Plant conc ng/kg ww	BSAF (USEPA 2008)	Invert conc ng/kg ww	Fish conc ng/kg ww	WHO/ USEPA Mammal TEF	Plant Mammalian TEQ ng/kg ww	Invert Mammalian TEQ ng/kg ww	Fish Mammalian TEQ ng/kg ww	WHO/ USEPA Avian TEF	Plant Avian TEQ ng/kg ww	Invert Avian TEQ ng/kg ww	Fish Avian TEQ ng/kg ww
1,2,3,4,6,7,8-HpCDD	2.40E+05	2.90E-04	1.81E+01	8.00E-03	4.14E+01	1.78E+02	1.00E-02	1.81E-01	4.14E-01	1.78E+00	1.00E-03	1.81E-02	4.14E-02	1.78E-01
1,2,3,4,6,7,8-HpCDF	2.20E+04	6.20E-05	3.55E-01	1.00E-03	4.74E-01	2.04E+00	1.00E-02	3.55E-03	4.74E-03	2.04E-02	1.00E-02	3.55E-03	4.74E-03	2.04E-02
1,2,3,4,7,8,9-HpCDF	2.20E+03	2.20E-03	1.26E+00	3.00E-02	1.42E+00	6.13E+00	1.00E-02	1.26E-02	1.42E-02	6.13E-02	1.00E-02	1.26E-02	1.42E-02	6.13E-02
1,2,3,4,7,8-HxCDD	1.30E+03	1.70E-03	5.75E-01	3.00E-02	8.40E-01	3.63E+00	1.00E-01	5.75E-02	8.40E-02	3.63E-01	5.00E-02	2.87E-02	4.20E-02	1.81E-01
1,2,3,4,7,8-HxCDF	1.20E+03	4.30E-04	1.34E-01	1.00E-02	2.58E-01	1.12E+00	1.00E-01	1.34E-02	2.58E-02	1.12E-01	1.00E-01	1.34E-02	2.58E-02	1.12E-01
1,2,3,6,7,8-HxCDD	9.80E+03	6.70E-04	1.71E+00	2.00E-02	4.22E+00	1.82E+01	1.00E-01	1.71E-01	4.22E-01	1.82E+00	1.00E-02	1.71E-02	4.22E-02	1.82E-01
1,2,3,6,7,8-HxCDF	7.40E+02	1.10E-03	2.12E-01	1.00E-02	1.59E-01	6.88E-01	1.00E-01	2.12E-02	1.59E-02	6.88E-02	1.00E-01	2.12E-02	1.59E-02	6.88E-02
1,2,3,7,8,9-HxCDD	2.60E+03	7.80E-04	5.27E-01	2.00E-02	1.12E+00	4.83E+00	1.00E-01	5.27E-02	1.12E-01	4.83E-01	1.00E-01	5.27E-02	1.12E-01	4.83E-01
1,2,3,7,8,9-HxCDF	6.40E+02	3.50E-03	5.82E-01	4.00E-02	5.51E-01	2.38E+00	1.00E-01	5.82E-02	5.51E-02	2.38E-01	1.00E-01	5.82E-02	5.51E-02	2.38E-01
1,2,3,7,8-PeCDD	2.70E+02	5.20E-03	3.65E-01	1.80E-01	1.05E+00	4.52E+00	1.00E+00	3.65E-01	1.05E+00	4.52E+00	1.00E+00	3.65E-01	1.05E+00	4.52E+00
1,2,3,7,8-PeCDF	1.50E+02	1.10E-03	4.29E-02	1.00E-02	3.23E-02	1.39E-01	3.00E-02	1.29E-03	9.69E-04	4.18E-03	1.00E-01	4.29E-03	3.23E-03	1.39E-02
2,3,4,6,7,8-HxCDF	1.40E+03	3.80E-03	1.38E+00	5.00E-02	1.51E+00	6.51E+00	1.00E-01	1.38E-01	1.51E-01	6.51E-01	1.00E-01	1.38E-01	1.51E-01	6.51E-01
2,3,4,7,8-PeCDF	8.10E+02	9.00E-03	1.90E+00	3.30E-01	5.76E+00	2.48E+01	3.00E-01	5.69E-01	1.73E+00	7.45E+00	1.00E+00	1.90E+00	5.76E+00	2.48E+01
2,3,7,8-TCDD	4.70E+01	5.60E-03	6.84E-02	2.00E-01	2.02E-01	8.74E-01	1.00E+00	6.84E-02	2.02E-01	8.74E-01	1.00E+00	6.84E-02	2.02E-01	8.74E-01
2,3,7,8-TCDF	8.20E+01	4.50E-03	9.59E-02	1.20E-01	2.12E-01	9.15E-01	1.00E-01	9.59E-03	2.12E-02	9.15E-02	1.00E+00	9.59E-02	2.12E-01	9.15E-01
OCDD	2.20E+06	6.70E-05	3.83E+01	5.00E-04	2.37E+01	1.02E+02	3.00E-04	1.15E-02	7.11E-03	3.07E-02	1.00E-04	3.83E-03	2.37E-03	1.02E-02
OCDF	1.50E+05	9.00E-05	3.51E+00	1.00E-03	3.23E+00	1.39E+01	3.00E-04	1.05E-03	9.69E-04	4.18E-03	1.00E-04	3.51E-04	3.23E-04	1.39E-03
Mammalian TEQ	5.69E+03	5.60E-03	8.28E+00	2.00E-01	2.45E+01	1.06E+02	NA	1.73E+00	4.30E+00	1.86E+01	NA	NA	NA	NA
Avian TEQ	2.76E+03	5.60E-03	4.02E+00	2.00E-01	1.19E+01	5.13E+01	NA	NA	NA	NA	NA	2.80E+00	7.73E+00	3.34E+01

Table 4-2 Uptake into Food Items
International Paper, Inc. - Former Wood Treating Site
Wiggins, Mississippi

Sediment	SD-5 ng/kg dw (6/28/2016)	R6 Uptake factor for plants (DW)	Plant conc ng/kg ww	BSAF (USEPA 2008)	Invert conc ng/kg ww	Fish conc ng/kg ww	WHO/ USEPA Mammal TEF	Plant Mammalian TEQ ng/kg ww	Invert Mammalian TEQ ng/kg ww	Fish Mammalian TEQ ng/kg ww	WHO/ USEPA Avian TEF	Plant Avian TEQ ng/kg ww	Invert Avian TEQ ng/kg ww	Fish Avian TEQ ng/kg ww
1,2,3,4,6,7,8-HpCDD	9.40E+04	2.90E-04	7.09E+00	8.00E-03	1.62E+01	6.99E+01	1.00E-02	7.09E-02	1.62E-01	6.99E-01	1.00E-03	7.09E-03	1.62E-02	6.99E-02
1,2,3,4,6,7,8-HpCDF	1.40E+04	6.20E-05	2.26E-01	1.00E-03	3.02E-01	1.30E+00	1.00E-02	2.26E-03	3.02E-03	1.30E-02	1.00E-02	2.26E-03	3.02E-03	1.30E-02
1,2,3,4,7,8,9-HpCDF	1.40E+03	2.20E-03	8.01E-01	3.00E-02	9.05E-01	3.90E+00	1.00E-02	8.01E-03	9.05E-03	3.90E-02	1.00E-02	8.01E-03	9.05E-03	3.90E-02
1,2,3,4,7,8-HxCDD	6.00E+02	1.70E-03	2.65E-01	3.00E-02	3.88E-01	1.67E+00	1.00E-01	2.65E-02	3.88E-02	1.67E-01	5.00E-02	1.33E-02	1.94E-02	8.37E-02
1,2,3,4,7,8-HxCDF	5.30E+02	4.30E-04	5.93E-02	1.00E-02	1.14E-01	4.93E-01	1.00E-01	5.93E-03	1.14E-02	4.93E-02	1.00E-01	5.93E-03	1.14E-02	4.93E-02
1,2,3,6,7,8-HxCDD	3.30E+03	6.70E-04	5.75E-01	2.00E-02	1.42E+00	6.13E+00	1.00E-01	5.75E-02	1.42E-01	6.13E-01	1.00E-02	5.75E-03	1.42E-02	6.13E-02
1,2,3,6,7,8-HxCDF	4.40E+02	1.10E-03	1.26E-01	1.00E-02	9.48E-02	4.09E-01	1.00E-01	1.26E-02	9.48E-03	4.09E-02	1.00E-01	1.26E-02	9.48E-03	4.09E-02
1,2,3,7,8,9-HxCDD	1.50E+03	7.80E-04	3.04E-01	2.00E-02	6.46E-01	2.79E+00	1.00E-01	3.04E-02	6.46E-02	2.79E-01	1.00E-01	3.04E-02	6.46E-02	2.79E-01
1,2,3,7,8,9-HxCDF	1.90E+02	3.50E-03	1.73E-01	4.00E-02	1.64E-01	7.06E-01	1.00E-01	1.73E-02	1.64E-02	7.06E-02	1.00E-01	1.73E-02	1.64E-02	7.06E-02
1,2,3,7,8-PeCDD	2.00E+02	5.20E-03	2.70E-01	1.80E-01	7.75E-01	3.35E+00	1.00E+00	2.70E-01	7.75E-01	3.35E+00	1.00E+00	2.70E-01	7.75E-01	3.35E+00
1,2,3,7,8-PeCDF	6.80E+01	1.10E-03	1.94E-02	1.00E-02	1.46E-02	6.32E-02	3.00E-02	5.83E-04	4.39E-04	1.90E-03	1.00E-01	1.94E-03	1.46E-03	6.32E-03
2,3,4,6,7,8-HxCDF	7.30E+02	3.80E-03	7.21E-01	5.00E-02	7.86E-01	3.39E+00	1.00E-01	7.21E-02	7.86E-02	3.39E-01	1.00E-01	7.21E-02	7.86E-02	3.39E-01
2,3,4,7,8-PeCDF	1.80E+02	9.00E-03	4.21E-01	3.30E-01	1.28E+00	5.52E+00	3.00E-01	1.26E-01	3.84E-01	1.66E+00	1.00E+00	4.21E-01	1.28E+00	5.52E+00
2,3,7,8-TCDD	1.30E+01	5.60E-03	1.89E-02	2.00E-01	5.60E-02	2.42E-01	1.00E+00	1.89E-02	5.60E-02	2.42E-01	1.00E+00	1.89E-02	5.60E-02	2.42E-01
2,3,7,8-TCDF	1.50E+01	4.50E-03	1.76E-02	1.20E-01	3.88E-02	1.67E-01	1.00E-01	1.76E-03	3.88E-03	1.67E-02	1.00E+00	1.76E-02	3.88E-02	1.67E-01
OCDD	8.00E+05	6.70E-05	1.39E+01	5.00E-04	8.62E+00	3.72E+01	3.00E-04	4.18E-03	2.58E-03	1.12E-02	1.00E-04	1.39E-03	8.62E-04	3.72E-03
OCDF	4.60E+04	9.00E-05	1.08E+00	1.00E-03	9.91E-01	4.28E+00	3.00E-04	3.23E-04	2.97E-04	1.28E-03	1.00E-04	1.08E-04	9.91E-05	4.28E-04
Mammalian TEQ	2.35E+03	5.60E-03	3.42E+00	2.00E-01	1.01E+01	4.36E+01	NA	7.26E-01	1.76E+00	7.59E+00	NA	NA	NA	NA
Avian TEQ	1.15E+03	5.60E-03	1.67E+00	2.00E-01	4.95E+00	2.14E+01	NA	NA	NA	NA	NA	9.06E-01	2.39E+00	1.03E+01

Table 4-2 Uptake into Food Items
International Paper, Inc. - Former Wood Treating Site
Wiggins, Mississippi

Sediment	SD-5 FD (SD-6) ng/kg dw (6/28/2016)	R6 Uptake factor for plants (DW)	Plant conc ng/kg ww	BSAF (USEPA 2008)	Invert conc ng/kg ww	Fish conc ng/kg ww	WHO/ USEPA Mammal TEF	Plant Mammalian TEQ ng/kg ww	Invert Mammalian TEQ ng/kg ww	Fish Mammalian TEQ ng/kg ww	WHO/ USEPA Avian TEF	Plant Avian TEQ ng/kg ww	Invert Avian TEQ ng/kg ww	Fish Avian TEQ ng/kg ww
1,2,3,4,6,7,8-HpCDD	8.80E+04	2.90E-04	6.64E+00	8.00E-03	1.52E+01	6.54E+01	1.00E-02	6.64E-02	1.52E-01	6.54E-01	1.00E-03	6.64E-03	1.52E-02	6.54E-02
1,2,3,4,6,7,8-HpCDF	1.60E+04	6.20E-05	2.58E-01	1.00E-03	3.45E-01	1.49E+00	1.00E-02	2.58E-03	3.45E-03	1.49E-02	1.00E-02	2.58E-03	3.45E-03	1.49E-02
1,2,3,4,7,8,9-HpCDF	1.80E+03	2.20E-03	1.03E+00	3.00E-02	1.16E+00	5.02E+00	1.00E-02	1.03E-02	1.16E-02	5.02E-02	1.00E-02	1.03E-02	1.16E-02	5.02E-02
1,2,3,4,7,8-HxCDD	6.60E+02	1.70E-03	2.92E-01	3.00E-02	4.26E-01	1.84E+00	1.00E-01	2.92E-02	4.26E-02	1.84E-01	5.00E-02	1.46E-02	2.13E-02	9.20E-02
1,2,3,4,7,8-HxCDF	6.00E+02	4.30E-04	6.71E-02	1.00E-02	1.29E-01	5.58E-01	1.00E-01	6.71E-03	1.29E-02	5.58E-02	1.00E-01	6.71E-03	1.29E-02	5.58E-02
1,2,3,6,7,8-HxCDD	3.40E+03	6.70E-04	5.92E-01	2.00E-02	1.46E+00	6.32E+00	1.00E-01	5.92E-02	1.46E-01	6.32E-01	1.00E-02	5.92E-03	1.46E-02	6.32E-02
1,2,3,6,7,8-HxCDF	4.70E+02	1.10E-03	1.34E-01	1.00E-02	1.01E-01	4.37E-01	1.00E-01	1.34E-02	1.01E-02	4.37E-02	1.00E-01	1.34E-02	1.01E-02	4.37E-02
1,2,3,7,8,9-HxCDD	1.60E+03	7.80E-04	3.24E-01	2.00E-02	6.89E-01	2.97E+00	1.00E-01	3.24E-02	6.89E-02	2.97E-01	1.00E-01	3.24E-02	6.89E-02	2.97E-01
1,2,3,7,8,9-HxCDF	2.10E+02	3.50E-03	1.91E-01	4.00E-02	1.81E-01	7.81E-01	1.00E-01	1.91E-02	1.81E-02	7.81E-02	1.00E-01	1.91E-02	1.81E-02	7.81E-02
1,2,3,7,8-PeCDD	2.20E+02	5.20E-03	2.97E-01	1.80E-01	8.53E-01	3.68E+00	1.00E+00	2.97E-01	8.53E-01	3.68E+00	1.00E+00	2.97E-01	8.53E-01	3.68E+00
1,2,3,7,8-PeCDF	7.00E+01	1.10E-03	2.00E-02	1.00E-02	1.51E-02	6.51E-02	3.00E-02	6.01E-04	4.52E-04	1.95E-03	1.00E-01	2.00E-03	1.51E-03	6.51E-03
2,3,4,6,7,8-HxCDF	8.50E+02	3.80E-03	8.40E-01	5.00E-02	9.15E-01	3.95E+00	1.00E-01	8.40E-02	9.15E-02	3.95E-01	1.00E-01	8.40E-02	9.15E-02	3.95E-01
2,3,4,7,8-PeCDF	1.80E+02	9.00E-03	4.21E-01	3.30E-01	1.28E+00	5.52E+00	3.00E-01	1.26E-01	3.84E-01	1.66E+00	1.00E+00	4.21E-01	1.28E+00	5.52E+00
2,3,7,8-TCDD	1.40E+01	5.60E-03	2.04E-02	2.00E-01	6.03E-02	2.60E-01	1.00E+00	2.04E-02	6.03E-02	2.60E-01	1.00E+00	2.04E-02	6.03E-02	2.60E-01
2,3,7,8-TCDF	1.40E+01	4.50E-03	1.64E-02	1.20E-01	3.62E-02	1.56E-01	1.00E-01	1.64E-03	3.62E-03	1.56E-02	1.00E+00	1.64E-02	3.62E-02	1.56E-01
OCDD	8.70E+05	6.70E-05	1.52E+01	5.00E-04	9.37E+00	4.04E+01	3.00E-04	4.55E-03	2.81E-03	1.21E-02	1.00E-04	1.52E-03	9.37E-04	4.04E-03
OCDF	5.30E+04	9.00E-05	1.24E+00	1.00E-03	1.14E+00	4.93E+00	3.00E-04	3.72E-04	3.42E-04	1.48E-03	1.00E-04	1.24E-04	1.14E-04	4.93E-04
Mammalian TEQ	2.41E+03	5.60E-03	3.50E+00	2.00E-01	1.04E+01	4.47E+01	NA	7.75E-01	1.86E+00	8.03E+00	NA	NA	NA	NA
Avian TEQ	1.23E+03	5.60E-03	1.80E+00	2.00E-01	5.31E+00	2.29E+01	NA	NA	NA	NA	NA	9.55E-01	2.50E+00	1.08E+01

Table 4-2 Uptake into Food Items
International Paper, Inc. - Former Wood Treating Site
Wiggins, Mississippi

Sediment	SD-7 ng/kg dw (6/28/2016)	R6 Uptake factor for plants (DW)	Plant conc ng/kg ww	BSAF (USEPA 2008)	Invert conc ng/kg ww	Fish conc ng/kg ww	WHO/ USEPA Mammal TEF	Plant Mammalian TEQ ng/kg ww	Invert Mammalian TEQ ng/kg ww	Fish Mammalian TEQ ng/kg ww	WHO/ USEPA Avian TEF	Plant Avian TEQ ng/kg ww	Invert Avian TEQ ng/kg ww	Fish Avian TEQ ng/kg ww
1,2,3,4,6,7,8-HpCDD	4.50E+04	2.90E-04	3.39E+00	8.00E-03	7.75E+00	3.35E+01	1.00E-02	3.39E-02	7.75E-02	3.35E-01	1.00E-03	3.39E-03	7.75E-03	3.35E-02
1,2,3,4,6,7,8-HpCDF	8.10E+03	6.20E-05	1.31E-01	1.00E-03	1.74E-01	7.53E-01	1.00E-02	1.31E-03	1.74E-03	7.53E-03	1.00E-02	1.31E-03	1.74E-03	7.53E-03
1,2,3,4,7,8,9-HpCDF	1.00E+03	2.20E-03	5.72E-01	3.00E-02	6.46E-01	2.79E+00	1.00E-02	5.72E-03	6.46E-03	2.79E-02	1.00E-02	5.72E-03	6.46E-03	2.79E-02
1,2,3,4,7,8-HxCDD	3.00E+02	1.70E-03	1.33E-01	3.00E-02	1.94E-01	8.37E-01	1.00E-01	1.33E-02	1.94E-02	8.37E-02	5.00E-02	6.63E-03	9.69E-03	4.18E-02
1,2,3,4,7,8-HxCDF	2.80E+02	4.30E-04	3.13E-02	1.00E-02	6.03E-02	2.60E-01	1.00E-01	3.13E-03	6.03E-03	2.60E-02	1.00E-01	3.13E-03	6.03E-03	2.60E-02
1,2,3,6,7,8-HxCDD	1.30E+03	6.70E-04	2.26E-01	2.00E-02	5.60E-01	2.42E+00	1.00E-01	2.26E-02	5.60E-02	2.42E-01	1.00E-02	2.26E-03	5.60E-03	2.42E-02
1,2,3,6,7,8-HxCDF	2.50E+02	1.10E-03	7.15E-02	1.00E-02	5.38E-02	2.32E-01	1.00E-01	7.15E-03	5.38E-03	2.32E-02	1.00E-01	7.15E-03	5.38E-03	2.32E-02
1,2,3,7,8,9-HxCDD	7.20E+02	7.80E-04	1.46E-01	2.00E-02	3.10E-01	1.34E+00	1.00E-01	1.46E-02	3.10E-02	1.34E-01	1.00E-01	1.46E-02	3.10E-02	1.34E-01
1,2,3,7,8,9-HxCDF	7.70E+01	3.50E-03	7.01E-02	4.00E-02	6.63E-02	2.86E-01	1.00E-01	7.01E-03	6.63E-03	2.86E-02	1.00E-01	7.01E-03	6.63E-03	2.86E-02
1,2,3,7,8-PeCDD	8.90E+01	5.20E-03	1.20E-01	1.80E-01	3.45E-01	1.49E+00	1.00E+00	1.20E-01	3.45E-01	1.49E+00	1.00E+00	1.20E-01	3.45E-01	1.49E+00
1,2,3,7,8-PeCDF	1.25E+01	1.10E-03	3.58E-03	1.00E-02	2.69E-03	1.16E-02	3.00E-02	1.07E-04	8.08E-05	3.49E-04	1.00E-01	3.58E-04	2.69E-04	1.16E-03
2,3,4,6,7,8-HxCDF	3.90E+02	3.80E-03	3.85E-01	5.00E-02	4.20E-01	1.81E+00	1.00E-01	3.85E-02	4.20E-02	1.81E-01	1.00E-01	3.85E-02	4.20E-02	1.81E-01
2,3,4,7,8-PeCDF	8.40E+01	9.00E-03	1.97E-01	3.30E-01	5.97E-01	2.58E+00	3.00E-01	5.90E-02	1.79E-01	7.73E-01	1.00E+00	1.97E-01	5.97E-01	2.58E+00
2,3,7,8-TCDD	1.00E+01	5.60E-03	1.46E-02	2.00E-01	4.31E-02	1.86E-01	1.00E+00	1.46E-02	4.31E-02	1.86E-01	1.00E+00	1.46E-02	4.31E-02	1.86E-01
2,3,7,8-TCDF	6.80E+00	4.50E-03	7.96E-03	1.20E-01	1.76E-02	7.58E-02	1.00E-01	7.96E-04	1.76E-03	7.58E-03	1.00E+00	7.96E-03	1.76E-02	7.58E-02
OCDD	3.90E+05	6.70E-05	6.79E+00	5.00E-04	4.20E+00	1.81E+01	3.00E-04	2.04E-03	1.26E-03	5.44E-03	1.00E-04	6.79E-04	4.20E-04	1.81E-03
OCDF	3.40E+04	9.00E-05	7.96E-01	1.00E-03	7.32E-01	3.16E+00	3.00E-04	2.39E-04	2.20E-04	9.48E-04	1.00E-04	7.96E-05	7.32E-05	3.16E-04
Mammalian TEQ	1.13E+03	5.60E-03	1.64E+00	2.00E-01	4.85E+00	2.09E+01	NA	3.44E-01	8.23E-01	3.55E+00	NA	NA	NA	NA
Avian TEQ	5.69E+02	5.60E-03	8.29E-01	2.00E-01	2.45E+00	1.06E+01	NA	NA	NA	NA	NA	4.30E-01	1.13E+00	4.86E+00

Table 4-2 Uptake into Food Items
International Paper, Inc. - Former Wood Treating Site
Wiggins, Mississippi

Sediment	Avg ng/kg dw	R6 Uptake factor for plants (DW)	Plant conc ng/kg ww	BSAF (USEPA 2008)	Invert conc ng/kg ww	Fish conc ng/kg ww	WHO/ USEPA Mammal TEF	Plant Mammalian TEQ ng/kg ww	Invert Mammalian TEQ ng/kg ww	Fish Mammalian TEQ ng/kg ww	WHO/ USEPA Avian TEF	Plant Avian TEQ ng/kg ww	Invert Avian TEQ ng/kg ww	Fish Avian TEQ ng/kg ww
1,2,3,4,6,7,8-HpCDD	1.17E+05	2.90E-04	8.80E+00	8.00E-03	2.01E+01	8.68E+01	1.00E-02	8.80E-02	2.01E-01	8.68E-01	1.00E-03	8.80E-03	2.01E-02	8.68E-02
1,2,3,4,6,7,8-HpCDF	1.50E+04	6.20E-05	2.42E-01	1.00E-03	3.24E-01	1.40E+00	1.00E-02	2.42E-03	3.24E-03	1.40E-02	1.00E-02	2.42E-03	3.24E-03	1.40E-02
1,2,3,4,7,8,9-HpCDF	1.60E+03	2.20E-03	9.15E-01	3.00E-02	1.03E+00	4.46E+00	1.00E-02	9.15E-03	1.03E-02	4.46E-02	1.00E-02	9.15E-03	1.03E-02	4.46E-02
1,2,3,4,7,8-HxCDD	7.15E+02	1.70E-03	3.16E-01	3.00E-02	4.62E-01	1.99E+00	1.00E-01	3.16E-02	4.62E-02	1.99E-01	5.00E-02	1.58E-02	2.31E-02	9.97E-02
1,2,3,4,7,8-HxCDF	6.53E+02	4.30E-04	7.29E-02	1.00E-02	1.41E-01	6.06E-01	1.00E-01	7.29E-03	1.41E-02	6.06E-02	1.00E-01	7.29E-03	1.41E-02	6.06E-02
1,2,3,6,7,8-HxCDD	4.45E+03	6.70E-04	7.75E-01	2.00E-02	1.92E+00	8.27E+00	1.00E-01	7.75E-02	1.92E-01	8.27E-01	1.00E-02	7.75E-03	1.92E-02	8.27E-02
1,2,3,6,7,8-HxCDF	4.75E+02	1.10E-03	1.36E-01	1.00E-02	1.02E-01	4.42E-01	1.00E-01	1.36E-02	1.02E-02	4.42E-02	1.00E-01	1.36E-02	1.02E-02	4.42E-02
1,2,3,7,8,9-HxCDD	1.61E+03	7.80E-04	3.25E-01	2.00E-02	6.91E-01	2.98E+00	1.00E-01	3.25E-02	6.91E-02	2.98E-01	1.00E-01	3.25E-02	6.91E-02	2.98E-01
1,2,3,7,8,9-HxCDF	2.79E+02	3.50E-03	2.54E-01	4.00E-02	2.41E-01	1.04E+00	1.00E-01	2.54E-02	2.41E-02	1.04E-01	1.00E-01	2.54E-02	2.41E-02	1.04E-01
1,2,3,7,8-PeCDD	1.95E+02	5.20E-03	2.63E-01	1.80E-01	7.55E-01	3.26E+00	1.00E+00	2.63E-01	7.55E-01	3.26E+00	1.00E+00	2.63E-01	7.55E-01	3.26E+00
1,2,3,7,8-PeCDF	7.51E+01	1.10E-03	2.15E-02	1.00E-02	1.62E-02	6.98E-02	3.00E-02	6.45E-04	4.85E-04	2.09E-03	1.00E-01	2.15E-03	1.62E-03	6.98E-03
2,3,4,6,7,8-HxCDF	8.43E+02	3.80E-03	8.32E-01	5.00E-02	9.07E-01	3.92E+00	1.00E-01	8.32E-02	9.07E-02	3.92E-01	1.00E-01	8.32E-02	9.07E-02	3.92E-01
2,3,4,7,8-PeCDF	3.14E+02	9.00E-03	7.34E-01	3.30E-01	2.23E+00	9.62E+00	3.00E-01	2.20E-01	6.68E-01	2.88E+00	1.00E+00	7.34E-01	2.23E+00	9.62E+00
2,3,7,8-TCDD	2.10E+01	5.60E-03	3.06E-02	2.00E-01	9.05E-02	3.90E-01	1.00E+00	3.06E-02	9.05E-02	3.90E-01	1.00E+00	3.06E-02	9.05E-02	3.90E-01
2,3,7,8-TCDF	2.95E+01	4.50E-03	3.45E-02	1.20E-01	7.61E-02	3.28E-01	1.00E-01	3.45E-03	7.61E-03	3.28E-02	1.00E+00	3.45E-02	7.61E-02	3.28E-01
OCDD	1.07E+06	6.70E-05	1.86E+01	5.00E-04	1.15E+01	4.95E+01	3.00E-04	5.57E-03	3.44E-03	1.48E-02	1.00E-04	1.86E-03	1.15E-03	4.95E-03
OCDF	7.08E+04	9.00E-05	1.66E+00	1.00E-03	1.52E+00	6.58E+00	3.00E-04	4.97E-04	4.57E-04	1.97E-03	1.00E-04	1.66E-04	1.52E-04	6.58E-04
Mammalian TEQ	2.89E+03	5.60E-03	4.21E+00	2.00E-01	1.25E+01	5.38E+01	NA	8.95E-01	2.19E+00	9.44E+00	NA	NA	NA	NA
Avian TEQ	1.43E+03	5.60E-03	2.08E+00	2.00E-01	6.15E+00	2.66E+01	NA	NA	NA	NA	NA	1.27E+00	3.44E+00	1.48E+01

Table 4-2 Uptake into Food Items
International Paper, Inc. - Former Wood Treating Site
Wiggins, Mississippi

BSAF	Biota Sediment Accumulation Factor.
DW	Dry weight.
mg/kg	Milligrams per kilogram
ng/kg	Nanograms per kilogram
R6	USEPA Region 6.
TEQ	Toxicity equivlents.
WHO	World Health Organization.
WW	Wet weight.

If the original source had values in dry weight, the values were converted to wet weight.
Fish are assumed to be 29% solids. The dry weight concentration is multiplied by 0.29 to convert to wet weight. (USEPA, 1993, Wildlife exposure factors handbook, Table 4-1.)
Invertebrates are assumed to be 21% solids. The dry weight is multiplied by 0.21 to convert to wet weight. (USEPA, 1993, Wildlife exposure factors handbook, Table 4-1.)
Plants are assumed to be 26% solids. The dry weight is multiplied by 0.26 to convert to wet weight. (USEPA, 1993, Wildlife exposure factors handbook, Table 4-1.)

Plant uptake factors are from USEPA. 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. EPA530-D-99-001A.
Fish and invertebrate sediment uptake values are BSAFs. The following equation describes the uptake:

$$BSAF = \frac{C_{fish\ or\ invert} / f_{lipid}}{C_{sediment} / f_{organic\ carbon}} \qquad C_{fish\ or\ invert} = \frac{C_{sediment}}{f_{organic\ carbon}} \text{ x } BSAF \text{ x } f_{lipid}$$

BSAFs are from USEPA 2008. Framework for Application of the Toxicity Equivalence Methodology for Polychlorinated Dioxins, Furans, and Biphenyls in Ecological Risk Assessment. EPA100/R-08/004. Tab

f oc sed	0.156	Fraction of organic carbon in sediment. Average of 15,560 mg/kg in sediment, or 15.6%.
f lipid fish	0.05	Brett Thomas, USEPA Region 4.
f lipid inverts	0.016	Estimated average fraction invertebrate lipid. Morrison et al., 1996 shows a variety of species.

Morrison et al., 1996. Morrison et al., 1996. Development and Verification of a Bioaccumulation Model for Organic Contaminants in Benthic Invertebrates. Environ. Sci. Technol. 30, 3377-3384. Average of % lipid values for plankton, zebra mussels, caddisfly larvae, gammarus copepods, and crayfish.

Table 4-3 Receptor Parameters
International Paper, Inc. - Former Wood Treating Site
Wiggins, Mississippi

Receptor Parameter	Species	Green Heron	Source	Raccoon	Source	Marsh Rice Rat	Source
BW	(kg)	0.241	a	5.894	b	0.051	m
IR f	(kg WW/day)	0.064	c	1.231	c	0.0232	c
IR sd	%	2% of diet	d	9% of diet	e	0.5-1% of diet	n
IR sd	(kg dw/day)	0.0013	f	0.111	f	0.00023	f
Aquatic Plants	Proportion	0	g	0.36	h	0.70	o
Aquatic Invertebrates	Proportion	0.07	g	0.40	h	0.25	o
Fish	Proportion	0.91	g	0.15	h	0.04	o
Range	(ha)	2	i	265	j	0.225	p
ED	(unitless)	1	k	1	k	1	k
AUF	(unitless)	1	k	0.03	l	1	k

a ORNL, 1997. Methods And Tools For Estimation Of The Exposure Of Terrestrial Wildlife To Contaminants. Average weight of 16 individuals from Louisana.
b Average of values from USEPA 1993. Wildlife Exposure Factors Handbook.
c Allometric equation from USEPA 1993 Wildlife Exposure Factors Handbook (for non-passerines and for all mammals).
d ORNL, 1997. Methods And Tools For Estimation Of The Exposure Of Terrestrial Wildlife To Contaminants indicages negilgible, but 2% is a conservative overestimate.
e Value from table 4-4, USEPA 1993.
f Calculated.
g ORNL, 1997. Methods And Tools For Estimation Of The Exposure Of Terrestrial Wildlife To Contaminants, individuals from Louisana.
h Estimated from USEPA 1993.
i Assumed.
j Average of values from USEPA 1993. Wildlife Exposure Factors Handbook.
k Default assumption
l Assumes site area is 8 hectares or 20 acres.
m Davis and Schmidly (1994)
n Beyer et al. (1994) Value of < 0.02 given for white-footed mouse, most ecologically similar mammal available in Beyer et al. 1994, so 1% was chosen.
o Wolfe (1982) Estimated, with a conservative assumption that more animals are eaten than plants.
p Wolfe (1982) Average of Maryland (75 m) and Florida (68 and 82m) range lengths. Assume 75 m long by 3 m wide.

Table 4-4 Calculation of Total Daily Intake
International Paper, Inc. - Former Wood Treating Site
Wiggins, Mississippi

Total daily intake for each location, assuming maximum sediment ingestion values.

SD-1	Sediment TEQ ng/kg dws	Plant TEQ ng/kg ww	Invert TEQ ng/kg ww	Fish TEQ ng/kg ww	Green Heron TDI ng/kg ww-d	Raccoon TDI ng/kg ww-d	Marsh Rice Rat TDI ng/kg ww-d
Mammalian TEQ	5.7975	6.74E-03	1.83E-02	7.91E-02	NA	3.40E-03	3.20E-02
Avian TEQ	7.7217	1.13E-02	3.18E-02	1.37E-01	7.45E-02	NA	NA

SD-3	Sediment TEQ ng/kg dws	Plant TEQ ng/kg ww	Invert TEQ ng/kg ww	Fish TEQ ng/kg ww	Green Heron TDI ng/kg ww-d	Raccoon TDI ng/kg ww-d	Marsh Rice Rat TDI ng/kg ww-d
Mammalian TEQ	5,688	1.73E+00	4.30E+00	1.86E+01	NA	3.24E+00	2.72E+01
Avian TEQ	2,762	2.80E+00	7.73E+00	3.34E+01	2.28E+01	NA	NA

SD-5	Sediment TEQ ng/kg dws	Plant TEQ ng/kg ww	Invert TEQ ng/kg ww	Fish TEQ ng/kg ww	Green Heron TDI ng/kg ww-d	Raccoon TDI ng/kg ww-d	Marsh Rice Rat TDI ng/kg ww-d
Mammalian TEQ	2,347	7.26E-01	1.76E+00	7.59E+00	NA	1.34E+00	1.12E+01
Avian TEQ	1,149	9.06E-01	2.39E+00	1.03E+01	8.62E+00	NA	NA

SD-5 FD (SD-6)	Sediment TEQ ng/kg dws	Plant TEQ ng/kg ww	Invert TEQ ng/kg ww	Fish TEQ ng/kg ww	Green Heron TDI ng/kg ww-d	Raccoon TDI ng/kg ww-d	Marsh Rice Rat TDI ng/kg ww-d
Mammalian TEQ	2,405	7.75E-01	1.86E+00	8.03E+00	NA	1.37E+00	1.15E+01
Avian TEQ	1,233	9.55E-01	2.50E+00	1.08E+01	9.18E+00	NA	NA

SD-7	Sediment TEQ ng/kg dws	Plant TEQ ng/kg ww	Invert TEQ ng/kg ww	Fish TEQ ng/kg ww	Green Heron TDI ng/kg ww-d	Raccoon TDI ng/kg ww-d	Marsh Rice Rat TDI ng/kg ww-d
Mammalian TEQ	1,125	3.44E-01	8.23E-01	3.55E+00	NA	6.40E-01	5.38E+00
Avian TEQ	569.15	4.30E-01	1.13E+00	4.86E+00	4.21E+00	NA	NA

Average	Sediment TEQ ng/kg dws	Plant TEQ ng/kg ww	Invert TEQ ng/kg ww	Fish TEQ ng/kg ww	Green Heron TDI ng/kg ww-d	Raccoon TDI ng/kg ww-d	Marsh Rice Rat TDI ng/kg ww-d
Mammalian TEQ	2,891	8.95E-01	2.19E+00	9.44E+00	NA	1.65E+00	1.39E+01
Avian TEQ	1,428	1.27E+00	3.44E+00	1.48E+01	1.12E+01	NA	NA

Table 4-4 Calculation of Total Daily Intake
International Paper, Inc. - Former Wood Treating Site
Wiggins, Mississippi

TDI for the raccoon and marsh rice rat at the average sediment concentration, with varying levels of sediment ingestion.

Sediment Ingestion	Sediment TEQ ng/kg dws	Plant TEQ ng/kg ww	Invert TEQ ng/kg ww	Fish TEQ ng/kg ww	Raccoon TDI ng/kg ww-d	Marsh Rice Rat TDI ng/kg ww-d
0%	2,891	8.95E-01	2.19E+00	9.44E+00	NA	7.05E-01
0.50%	2,891	8.95E-01	2.19E+00	9.44E+00	NA	7.28E+00
1%	2,891	8.95E-01	2.19E+00	9.44E+00	NA	1.39E+01
2%	2,891	8.95E-01	2.19E+00	9.44E+00	NA	
3%	2,891	8.95E-01	2.19E+00	9.44E+00	NA	
4%	2,891	8.95E-01	2.19E+00	9.44E+00	NA	
5%	2,891	8.95E-01	2.19E+00	9.44E+00	9.22E-01	
6%	2,891	8.95E-01	2.19E+00	9.44E+00	1.10E+00	
7%	2,891	8.95E-01	2.19E+00	9.44E+00	1.28E+00	
8%	2,891	8.95E-01	2.19E+00	9.44E+00	1.47E+00	
9%	2,891	8.95E-01	2.19E+00	9.44E+00	1.65E+00	

HQ Hazard Quotient.
LOAEL Lowest observed adverse effects level.
ng/kg Nanograms per kilogram
NOAEL No observed adverse effects level.
TDI Total Daily Intake.
TEQ Toxicity equivlents.

TDI Calculated as:

$$\text{Total Daily Intake} = \text{AUF x} \left[\frac{IR_{sediment} \text{ x } C_{sediment} + IR_{food} \text{ x } \sum (FIR_{food\,item} \times C_{food\,item})}{BW} \right]$$

Table 5-1 Toxicity Reference Values
International Paper, Inc. - Former Wood Treating Site
Wiggins, Mississippi

TRVs	NOAEL TRV ng/kg ww-d	LOAEL TRV ng/kg ww-d
Rat TEQ	1	10
Mink TEQ (Uncertainty)	8.4	31
Avian TEQ	14	64
Avian TEQ (Uncertainty)	14	140

Rat TRVs	ORNL. 1996. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision. ES/ER/TM-96/R2/. http://rais.ornl.gov/documents/tm96r2.pdf
Mink NOAEL (Uncertainty)	Moore, J.N., M.J. Zwiernik, J.L. Newsted, S.D. Fitzgerald, J.E. Link, P.W. Bradley, D.P. Kay, R.A. Budinsky, J.P. Giesy, and S.J. Bursian. 2011. "Effects of Dietary Exposure of Mink (Mustela Vison) to 2,3,7,8-Tetrachlorodibenzo-P-Dioxin, 2,3,4,7,8-Pentachlorodibenzofuran, and 2,3,7,8-Tetrachlorodibenzofuran on Reproduction and Offspring Viability and Growth." Environmental Toxicology and Chemistry 31, No. 2:360-9.
Mink LOAEL (Uncertainty)	Zwiernik, M.J., K.J. Beckett, S.J. Bursian, D.P. Kay, R.R. Holem, J.N. Moore, B. Yamini, and J.P. Giesy. 2009. "Chronic Effects of Polychlorinated Dibenzofurans on Mink in Laboratory and Field Environments." Integ. Environ. Assess. Manage 5:291-301.
Avian NOAEL	ORNL. 1996. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision. ES/ER/TM-96/R2/. http://rais.ornl.gov/documents/tm96r2.pdf
Avian LOAEL	Brett Thomas, USEPA Region 4.
Avian LOAEL (Uncertainty)	Nosek, J.A., S.R. Craven, J.R. Sullivan, S.S. Hurley, and R.E. Peterson. 1992a. "Toxicity and Reproductive Effects of 2,3,7,8-Tetrachlorodibenzo-P-Dioxin in Ring-Necked Pheasant Hens." J. Toxicol. Environ. Health 35:187-98. As shown in ORNL. 1996. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision. ES/ER/TM-96/R2/. http://rais.ornl.gov/documents/tm96r2.pdf

Table 6-1 Calculation of Hazard Quotients
International Paper, Inc. - Former Wood Treating Site
Wiggins, Mississippi

Green Heron HQs

Green Heron	Green Heron TDI ng/kg ww-d	NOAEL TRV ng/kg ww-d	LOAEL TRV ng/kg ww-d	Green Heron NOAEL HQ	Green Heron LOAEL HQ
Avian TRVs	1.12E+01	14	64	0.8	0.2
Avian Uncertainty TRVs	1.12E+01	14	140	0.8	0.08

Raccoon HQs

Sediment Ingestion	Raccoon TDI ng/kg ww-d	**Rat** NOAEL TRV ng/kg ww-d	**Rat** LOAEL TRV ng/kg ww-d	Raccoon NOAEL HQ	Raccoon LOAEL HQ
5%	9.22E-01	1	10	0.9	0.09
6%	1.10E+00	1	10	1	0.1
7%	1.28E+00	1	10	1	0.1
8%	1.47E+00	1	10	1	0.1
9%	1.65E+00	1	10	2	0.2

Sediment Ingestion	Raccoon TDI ng/kg ww-d	**Mink Uncertainty** NOAEL TRV ng/kg ww-d	**Mink Uncertainty** LOAEL TRV ng/kg ww-d	Raccoon NOAEL HQ	Raccoon LOAEL HQ
5%	9.22E-01	8.4	31	0.1	0.03
6%	1.10E+00	8.4	31	0.1	0.04
7%	1.28E+00	8.4	31	0.2	0.04
8%	1.47E+00	8.4	31	0.2	0.05
9%	1.65E+00	8.4	31	0.2	0.05

Table 6-1 Calculation of Hazard Quotients
International Paper, Inc. - Former Wood Treating Site
Wiggins, Mississippi

Marsh Rice Rat HQs

Sediment Ingestion	Marsh Rice Rat TDI ng/kg ww-d	Rat NOAEL TRV ng/kg ww-d	Rat LOAEL TRV ng/kg ww-d	Marsh Rice Rat NOAEL HQ	Marsh Rice Rat LOAEL HQ
0%	7.05E-01	1	10	0.7	0.07
0.50%	7.28E+00	1	10	7	0.7
1%	1.39E+01	1	10	10	1

AUF Area Use Factor.
HQ Hazard Quotient.
LOAEL Lowest observed adverse effects level.
ng/kg Nanograms per kilogram
NOAEL No observed adverse effects level.
TDI Total Daily Intake.
TEQ Toxicity equivlents.
TRV Toxicity Reference Value.

FIGURES

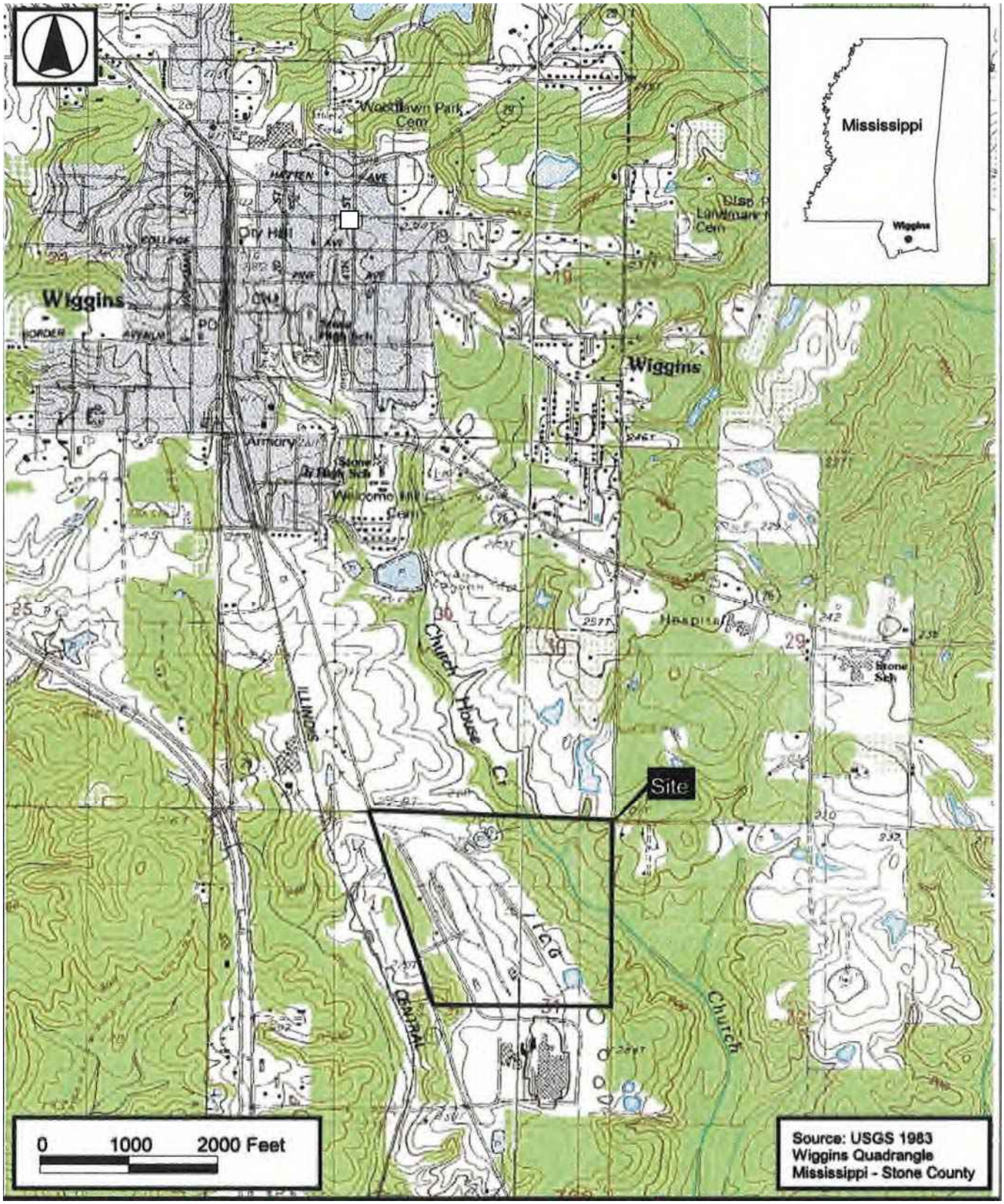


Figure courtesy of EARTHCON

RAMBOLL ENVIRON	**SITE LOCATION MAP** **CLOSED FORMER WOOD TREATING UNITS** **INTERNATIONAL PAPER WIGGINS, MS**	FIGURE 1-1
DRAFTED BY: PAL / DATE: Jan 2017		

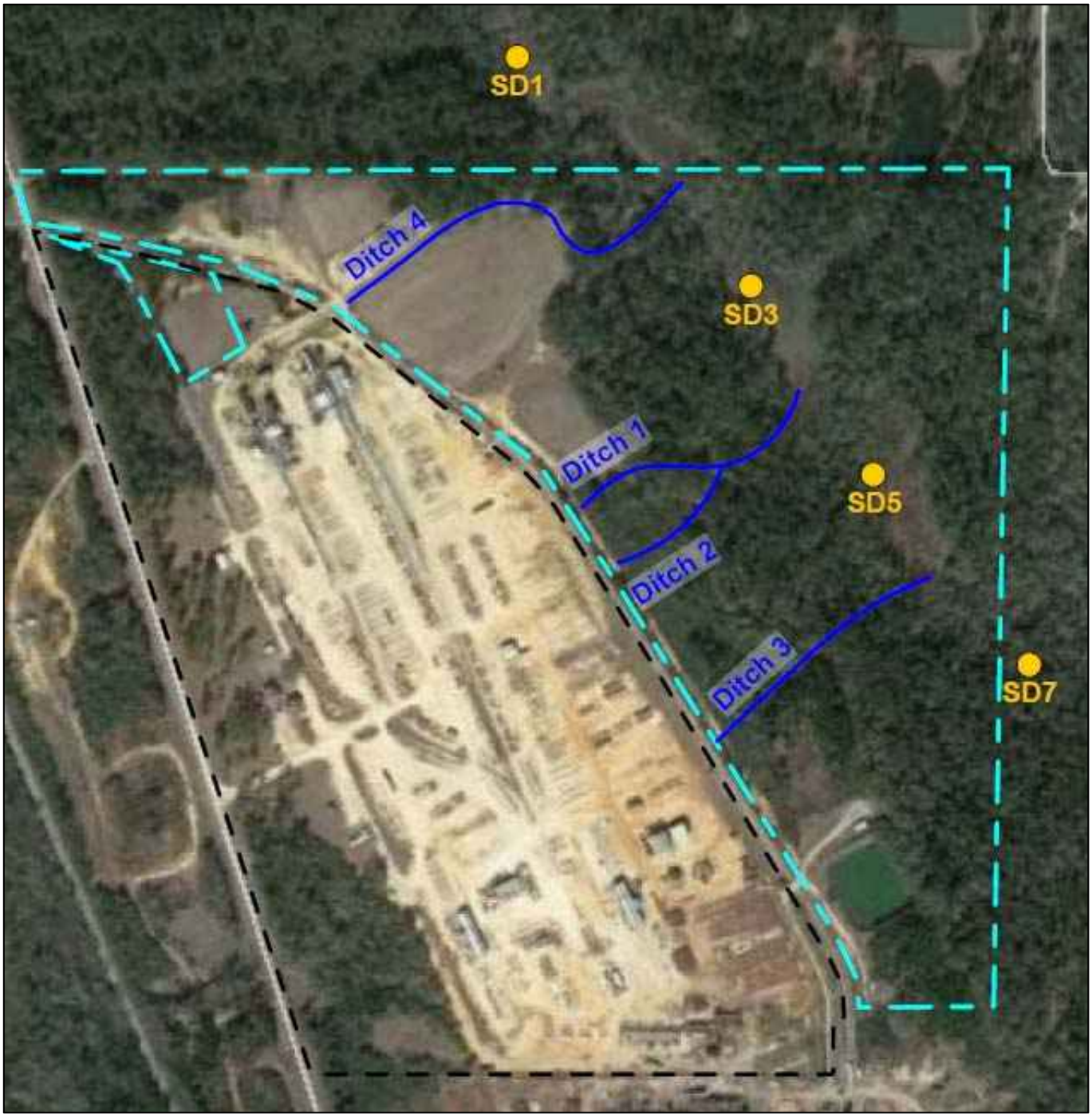


Figure courtesy of EARTHCON

RAMBOLL ENVIRON		**AERIAL PHOTO AND SAMPLING LOCATIONS CLOSED FORMER WOOD TREATING UNITS INTERNATIONAL PAPER WIGGINS, MS**	FIGURE 3-1
DRAFTED BY: PAL	DATE: Jan 2017		

Ponded area immediately upgradient of SD-2 (between SD-1 and SD-2).

RAMBOLL ENVIRON

DRAFTED BY: PAL

DATE: Jan 2017

PONDED AREA PHOTOGRAPHS
CLOSED FORMER WOOD TREATING UNITS
INTERNATIONAL PAPER WIGGINS, MS

FIGURE
3-2

Near SW-2/SD-3 area

Near SD-7 area

Near SD-6 area

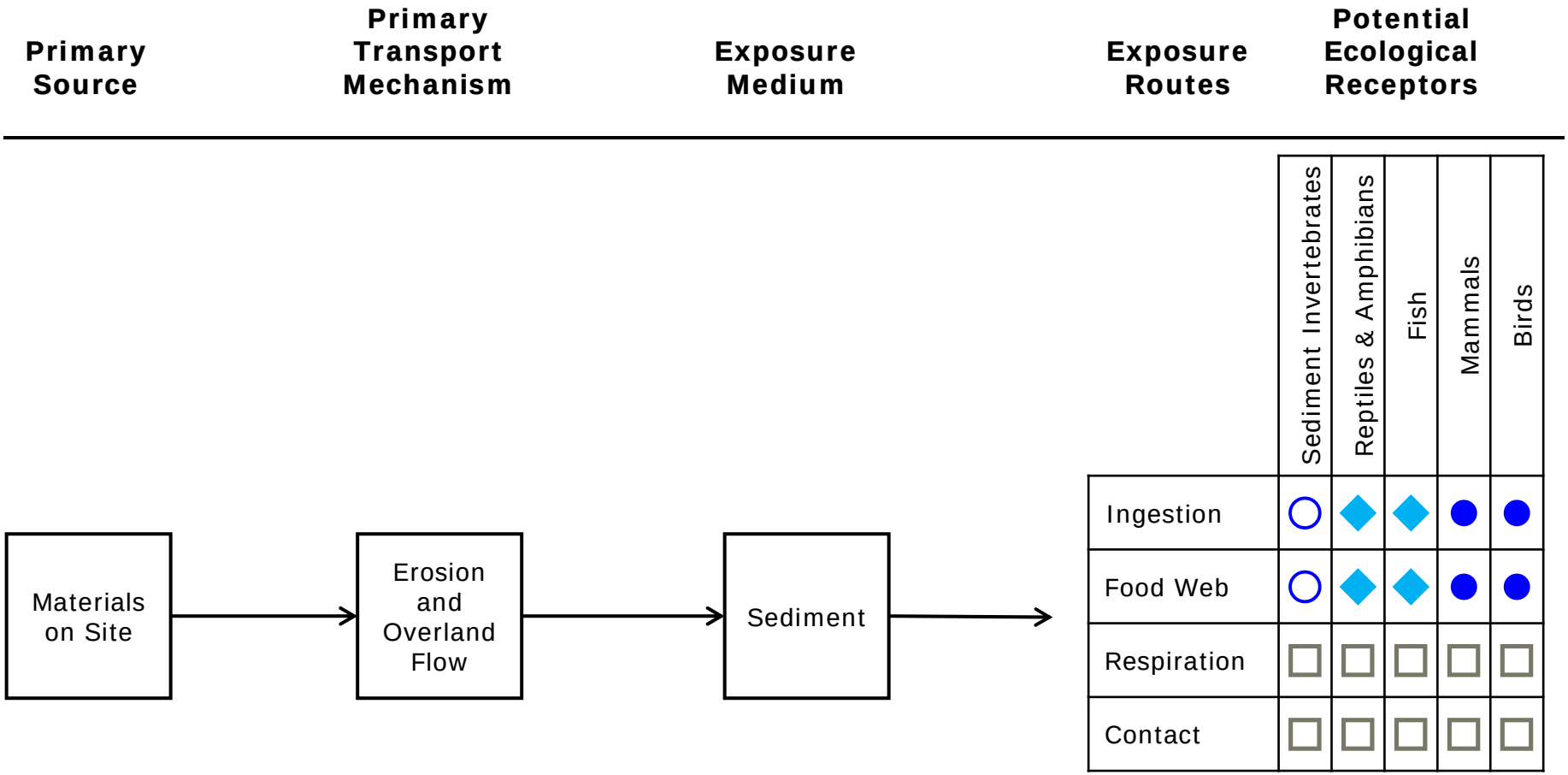
RAMBOLL ENVIRON

DRAFTED BY: PAL

DATE: Jan 2017

FOREST UNDERSTORY PHOTOGRAPHS
CLOSED FORMER WOOD TREATING UNITS
INTERNATIONAL PAPER WIGGINS, MS

FIGURE
3-3



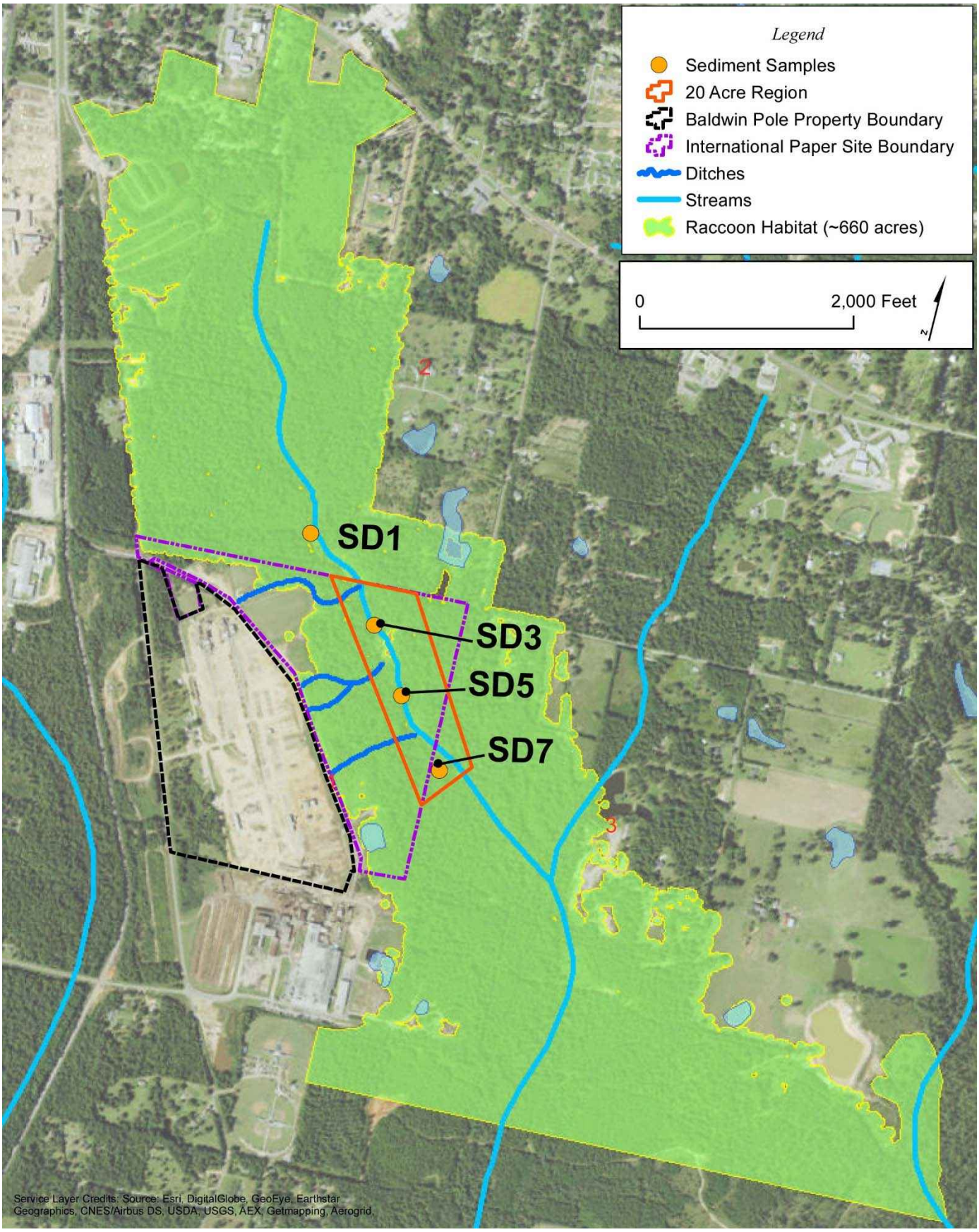
● Sensitive organism/pathway assessed in the screening ecological risk evaluation.
○ Organism/pathway is not sensitive to dioxins.
◆ Potential exposure pathway cannot be ruled out, but is considered less sensitive or less exposure than other receptors considered in the risk evaluation.
□ Pathway results in *de minimis* exposure of dioxins.

RAMBOLL ENVIRON

DRAFTED BY: PAL | DATE: Jan 2017

CONCEPTUAL SITE MODEL
CLOSED FORMER WOOD TREATING UNITS
INTERNATIONAL PAPER WIGGINS, MS

FIGURE
3-4



RAMBOLL ENVIRON

DRAFTED BY: PAL | DATE: Jan 2017

APPROXIMATE 20 ACRE AREA
CLOSED FORMER WOOD TREATING UNITS
INTERNATIONAL PAPER WIGGINS, MS

FIGURE
4-1

APPENDIX A
USEPA PRESENTATION MATERIALS (JANUARY 5, 2017)

INTERNATIONAL PAPER
WIGGINS, MS

RAMBOLL ENVIRON

DISCUSSION TOPICS

- Initial Meeting and Discussion with EPA (October 2016)
  - Data and Risk Screening Approach
  - Screening Results and Conclusions
  - Potential Path Forward
- Emailed information to EPA (October 2016)
- Comments from EPA (November 2016)
- Meeting Today (January 2017)
  - Data and Risk Screening Approach (showing differences)
  - Screening Results and Conclusions (showing differences)
  - Potential Path Forward

EPA NOVEMBER COMMENTS

- Receptor change
  - Add a smaller home range mammal (e.g., a marsh rice rat or something similar)
- Reduce Mammal TRV
  - NOAEL of 1 ng TEQ/kg-BW-day (vs 8.4 previously used, ~factor of 8 lower)
  - LOAEL of 10 ng TEQ/kg-BW-day (vs 31 previously used, ~factor of 3 lower)
- Reduce Avian TRV
  - NOAEL of 14 ng TEQ/kg-BW-day (vs 31 previously used, ~factor of 2 lower)
  - LOAEL of 64 ng TEQ/kg-BW-day (vs 140 previously used, ~factor of 2 lower)
- Increase fish lipids used to calculate the bioconcentration factors
  - Increase lipids to 5% (vs 1.6% previously used, ~factor of 3 higher)

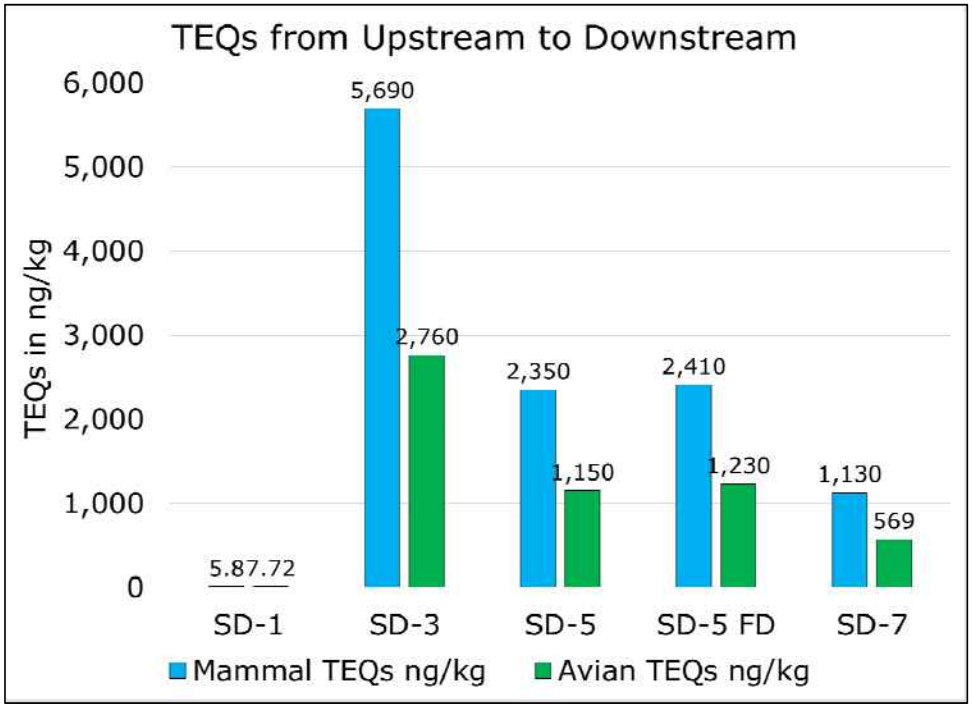
AVAILABLE SITE DATA

Former Wood Treating Units, Wiggins, MS
HW Permit 980-600-084
Supplemental CMS - Church House Branch (AOC B)

RAMBOLL ENVIRON

DIOXINS AND FURANS EXPRESSED AS 2,3,7,8-TCDD EQUIVALENTS (TEQ)

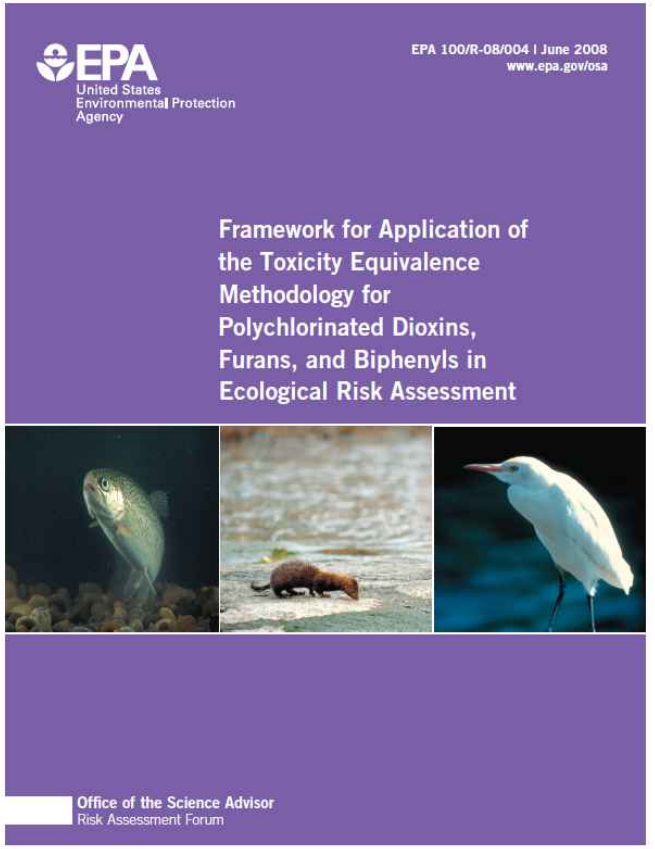
- 2,3,7,8-TCDD is most toxic of Ds/Fs



Constituent	WHO Mammal TEF	Avian TEF	Average Conc. ng/kg	Average Mammal TEQs ng/kg	Average Avian TEQs ng/kg
1,2,3,4,6,7,8-HpCDD	0.01	0.001	116,750	1,168	116.75
1,2,3,4,6,7,8-HpCDF	0.01	0.01	15,025	150.25	150.25
1,2,3,4,7,8,9-HpCDF	0.01	0.01	1,600	16	16
1,2,3,4,7,8-HxCDD	0.1	0.05	715	71.5	35.75
1,2,3,4,7,8-HxCDF	0.1	0.1	652.5	65.25	65.25
1,2,3,6,7,8-HxCDD	0.1	0.01	4,450	445	44.5
1,2,3,6,7,8-HxCDF	0.1	0.1	475	47.5	47.5
1,2,3,7,8,9-HxCDD	0.1	0.1	1,605	160.5	160.5
1,2,3,7,8,9-HxCDF	0.1	0.1	279.25	27.925	27.925
1,2,3,7,8-PeCDD	1	1	194.75	194.75	194.75
1,2,3,7,8-PeCDF	0.03	0.1	75.125	2.25375	7.5125
2,3,4,6,7,8-HxCDF	0.1	0.1	842.5	84.25	84.25
2,3,4,7,8-PeCDF	0.3	1	313.5	94.05	313.5
2,3,7,8-TCDD	1	1	21	21	21
2,3,7,8-TCDF	0.1	1	29.45	2.945	29.45
OCDD	0	0.0001	1,065,000	319.5	106.5
OCDF	0	0.0001	70,750	21.225	7.075
TEQ				2,890	1,430

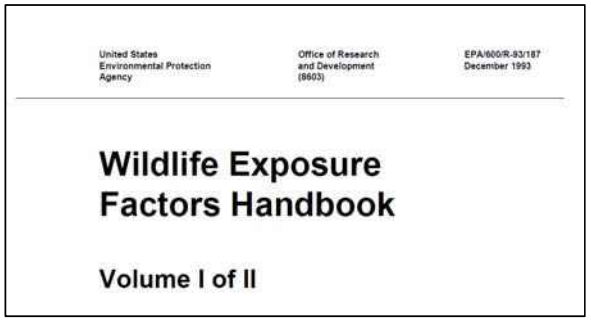
RISK SCREENING APPROACH

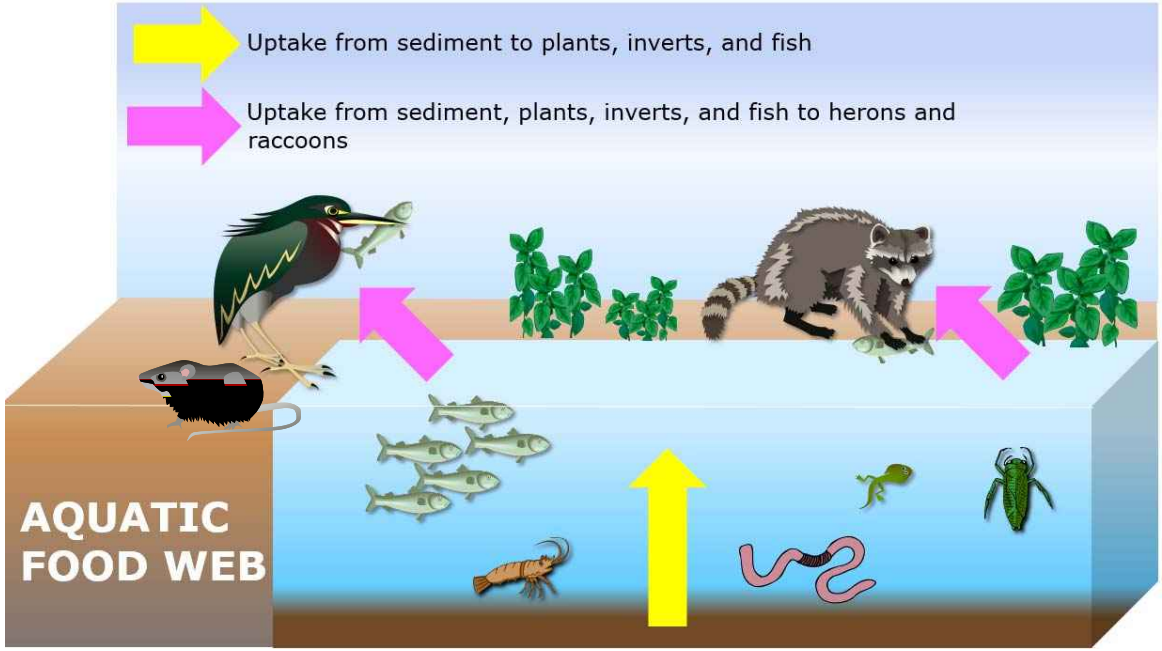
- Performed a simple food web model for raccoon and green heron
- Model takes sediment concentration and estimates concentrations in plants, invertebrates, and fish
- USEPA 2008 used for
  - Mammal and avian toxicity effects factors (TEFs) to compute 2,3,7,8-TCDD toxicity effects quotient (TEQ)
- Estimate total daily intake for dietary exposure



RAMBOLL ENVIRON

RECEPTOR DIETS





Receptor Parameter	Green Heron	Raccoon	Marsh Rat
Sediment	2%	2%-5% (9%)	0%-1%
Aquatic Plants	0%	36%	40%
Aquatic Invertebrates	7%	40%	40%
Fish	91%	15%	20%

RAMBOLL ENVIRON

FOOD WEB MODEL

$$E_{total} = E_{food} + E_{incidental\ sediment\ ingestion}$$

Where:

E_{total} = total exposure from all dietary pathways (total daily intake – or TDI)

E_{food} = Exposure from food consumption

$E_{incidental\ sediment\ ingestion}$ = Exposure from soil/sediment

- Exposure expressed in terms of mg/kg-BW-day
- AUF is the area use factor

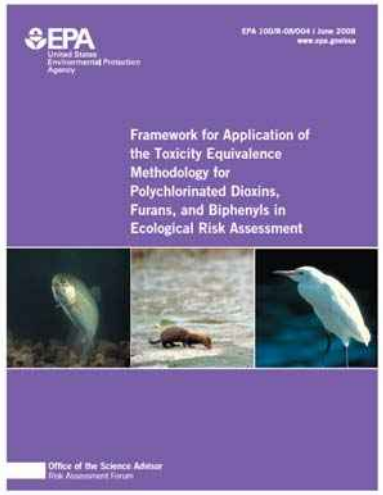
$$\text{Total Daily Intake} = AUF \times \left[\frac{IR_{sediment} \times C_{sediment} + IR_{food} \times \sum (FIR_{food\,item} \times C_{food\,item})}{BW} \right]$$

BSAF

- E_{food} is based on sediment concentrations multiplied by congener specific BSAFs summed to reflect dietary item TEQ
  - $C_{food} = C_{sed} \times BSAF$

  Where
  - $$BSAF = \frac{\frac{Concentration_{tissue}}{Fraction_{lipids}}}{\frac{Concentration_{sediment}}{Fraction_{organic\ carbon}}}$$

- In order to apply those, the following assumptions are used:
  - Fish are assumed to have approximately **5 %** lipids
  - Invertebrates are assumed to have approximately 1 to 2% lipids
- Measured organic carbon in sediment: 4,540 to 25,000 mg/kg



Biota-sediment accumulation factors are based on those provided in USEPA 2008

RAMBOLL ENVIRON

CALCULATED HAZARD QUOTIENTS

$$\text{Hazard Quotient} = \frac{\textbf{Total Daily Intake}}{\textbf{TRV}}$$

- HQ Interpretation
  - HQ < 1 no unacceptable risk
  - HQ > 1 must investigate further to understand risks
- Toxicity Reference Values (TRV)
  - Conservative "no risk" scenario (NOAEL)
  - More realistic "low risk" scenario (LOAEL)

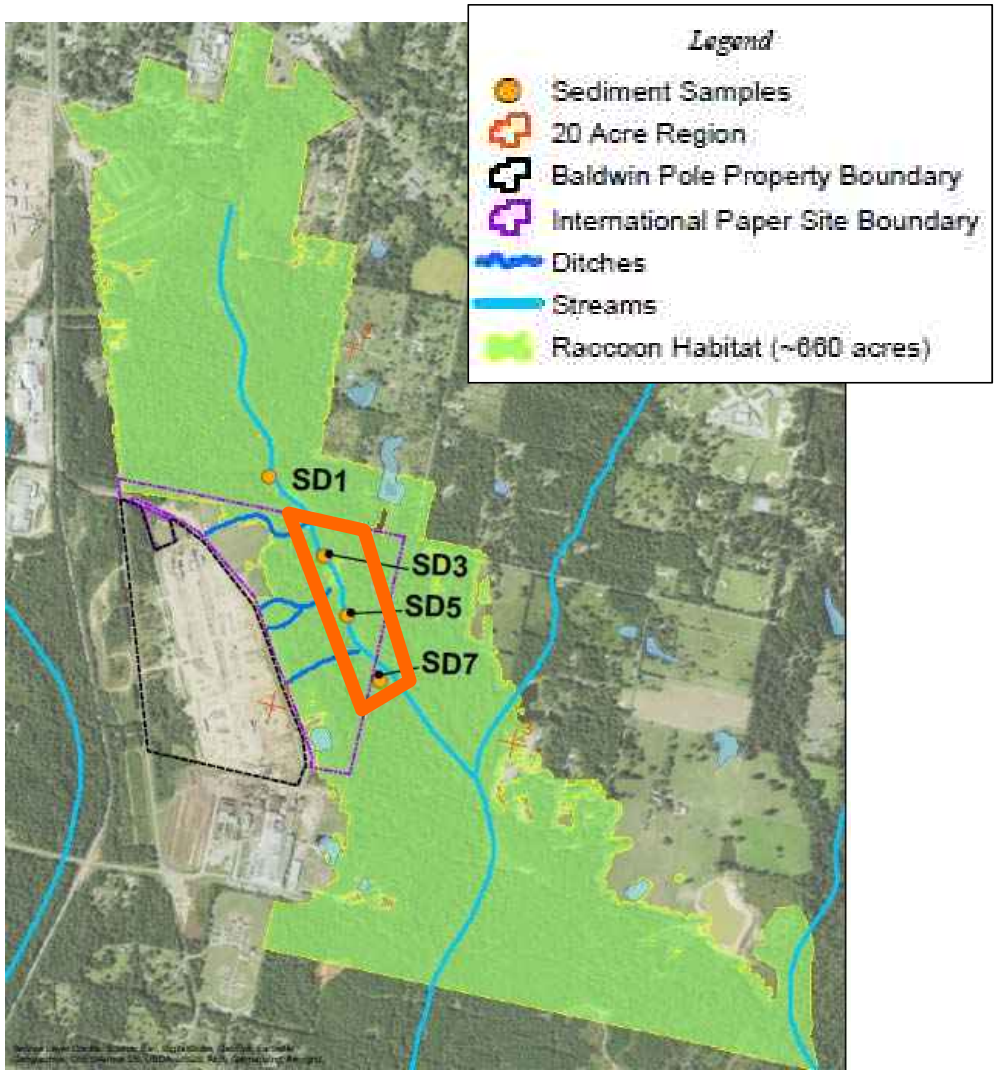
TRVS

TRVs	NOAEL TRV ng/kg ww-d	LOAEL TRV ng/kg ww-d
Rat TEQ	1	10
Mink TEQ (Uncertainty)	8.4	31
Avian TEQ	14	64
Avian TEQ (Uncertainty)	--	140

- Moore, J.N., M.J. Zwiernik, J.L. Newsted, S.D. Fitzgerald, J.E. Link, P.W. Bradley, D.P. Kay, R.A. Budinsky, J.P. Giesy, and S.J. Bursian. 2011. "Effects of Dietary Exposure of Mink (Mustela Vison) to 2,3,7,8-Tetrachlorodibenzo-P-Dioxin, 2,3,4,7,8-Pentachlorodibenzofuran, and 2,3,7,8-Tetrachlorodibenzofuran on Reproduction and Offspring Viability and Growth." Environmental Toxicology and Chemistry 31, No. 2:360-9.
- Zwiernik, M.J., K.J. Beckett, S.J. Bursian, D.P. Kay, R.R. Holem, J.N. Moore, B. Yamini, and J.P. Giesy. 2009. "Chronic Effects of Polychlorinated Dibenzofurans on Mink in Laboratory and Field Environments." Integ. Environ. Assess. Manage 5:291-301.
- ORNL. 1996. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision. ES/ER/TM-96/R2/. http://rais.ornl.gov/documents/tm96r2.pdf
- ORNL. 1996. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision. ES/ER/TM-96/R2/. http://rais.ornl.gov/documents/tm96r2.pdf

AREA USE FACTOR

- AUF of 1 used for both green heron and marsh rice rat
- Raccoon AUF based on home range
  - Conservatively estimated approximately 20 acres of on-site exposure area
  - USEPA 2003: Average raccoon home range ~ 1 square mile (655 acres)
  - AUF=1, AUF=0.03



RAMBOLL ENVIRON

DISCUSSION TOPICS

- Data and Risk Screening Approach
- Screening Results and Conclusions
- Potential Path Forward

RAMBOLL ENVIRON

SCREENING AND UNCERTAINTY RESULTS

Green Heron Average

All AUF = 1

	NOAEL HQ	LOAEL HQ
HQ Results	0.8	0.2
HQ Uncertainty	0.6	0.1

- Includes TRV change requested
- Includes the 5% lipids change
- HQs<1

SCREENING AND UNCERTAINTY RESULTS

- Raccoon: AUF = 0.03

Screening Results (Rat TRV)		
Sediment Ingestion	Raccoon NOAEL HQ	Raccoon LOAEL HQ
	AUF 0.03	**AUF 0.03**
2%	0.4	0.04
3%	0.6	0.06
4%	0.7	0.07
5%	0.9	0.09

Uncertainty Results (Mink TRV)		
Sediment Ingestion **Mink TRV**	Raccoon NOAEL HQ	Raccoon LOAEL HQ
	AUF 0.03	**AUF 0.03**
2%	0.04	0.01
3%	0.07	0.02
4%	0.09	0.02
5%	0.1	0.03

- Includes TRV change requested
- Includes the 5% lipids change
- HQs<1

UNCERTAINTY RESULTS (MINK TRV)

Sediment Ingestion	Raccoon NOAEL HQ	Raccoon LOAEL HQ
	AUF 0.03	**AUF 0.03**
2%	0.04	0.01
3%	0.07	0.02
4%	0.09	0.02
5%	0.1	0.03
6%	0.1	0.04
7%	0.2	0.04
8%	0.2	0.05
9%	0.2	0.05

SCREENING RESULTS (RAT TRV)

Sediment Ingestion	Raccoon NOAEL HQ	Raccoon LOAEL HQ
	AUF 0.03	**AUF 0.03**
2%	0.4	0.04
3%	0.6	0.06
4%	0.7	0.07
5%	0.9	0.09
6%	1	0.1
7%	1	0.1
8%	1	0.1
9%	2	0.2

SCREENING AND UNCERTAINTY RESULTS

- Raccoon: AUF = 0.03

Screening Results (Rat TRV)		
Sediment Ingestion	Raccoon NOAEL HQ	Raccoon LOAEL HQ
	AUF 0.03	**AUF 0.03**
2%	0.4	0.04
3%	0.6	0.06
4%	0.7	0.07
5%	0.9	0.09

Uncertainty Results (Mink TRV)		
Sediment Ingestion **Mink TRV**	Raccoon NOAEL HQ	Raccoon LOAEL HQ
	AUF 0.03	**AUF 0.03**
2%	0.04	0.01
3%	0.07	0.02
4%	0.09	0.02
5%	0.1	0.03

- Includes TRV change requested
- Includes the 5% lipids change
- HQs<1

SCREENING RESULTS

Marsh Rice Rat	Marsh Rice Rat NOAEL HQ	Marsh Rice Rat LOAEL HQ
Sediment Ingestion, Rat TRV, AUF = 1		
0%	0.8	0.08
0.50%	7	0.7
1%	10	1

CONCLUSIONS

- No unacceptable risks for green heron (HQs<1) even with conservative assumptions
- The raccoon
  - NOAEL and LOAEL HQs<1 when AUF applied
- The marsh rice rat
  - NOAEL HQs <1-10
  - LOAEL HQs <1
- Collectively, results support the conclusions
  - No unacceptable risks to mammal and bird populations that feed in Church House Branch
  - No further ecological risk assessment or action is warranted in Church House Branch

DISCUSSION TOPICS

- Data and Risk Screening Approach
- Screening Results and Conclusions
- Potential Path Forward

PATH FORWARD - REPORTING

- **Introduction and overview** – facility history
- **Problem Formulation**
  - Environmental Setting and Habitat - current environmental conditions, what organisms are at the site, are threatened/endangered species present
  - Conceptual site model - how and where are the organisms at the site in contact with the constituents
  - Description of receptors - why they were chosen, how they are good surrogates for other species, what sources were used, assessment and measurement endpoints
  - Exposure assessment - sediment concentrations, information on sampling (if needed)
- **Risk Screening**
  - Calculation of TEQs – sources of TEFs
  - Description of uptake factors - what sources they are from, how they are used, ww/dw conversions as needed
  - Total daily intake calculation
  - Effects assessment - Toxicity value descriptions and sources
  - Risk Characterization – hazard quotients
- **Discussion** – what the risk analysis means for organisms at the site, recommendations for further analysis (if any), uncertainties within the analysis
- **Conclusion** – No Further Action warranted based on potential risks to wildlife

END

RAMBOLL ENVIRON

APPENDIX B
USFWS IPAC REPORT

U.S. Fish & Wildlife Service

IPaC Trust Resources Report

Generated October 03, 2016 01:16 PM MDT, IPaC v3.0.9

This report is for informational purposes only and should not be used for planning or analyzing project level impacts. For project reviews that require U.S. Fish & Wildlife Service review or concurrence, please return to the IPaC website and request an official species list from the Regulatory Documents page.

IPaC - Information for Planning and Conservation (https://ecos.fws.gov/ipac/): A project planning tool to help streamline the U.S. Fish & Wildlife Service environmental review process.

Table of Contents

U.S. Fish & Wildlife Service

IPaC Trust Resources Report

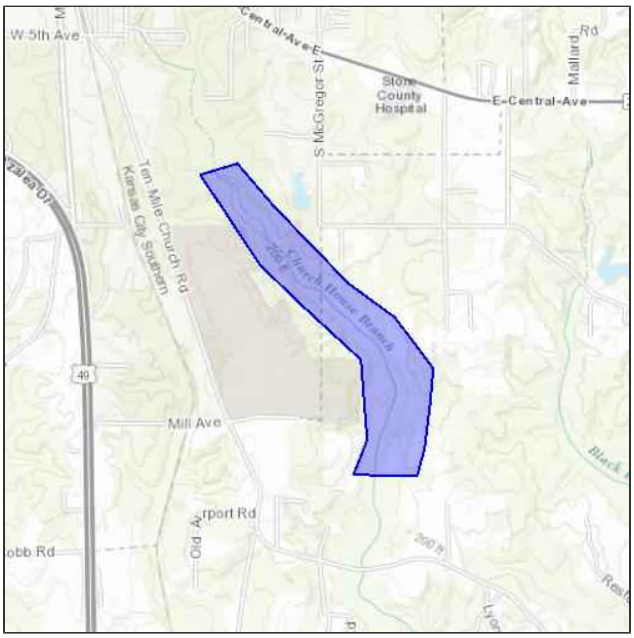
LOCATION

Stone County, Mississippi

IPAC LINK

https://ecos.fws.gov/ipac/project/JHV7J-E2K25-B5JGU-DJSUM-SSJQHI

165.41 acres



U.S. Fish & Wildlife Service Contact Information

Trust resources in this location are managed by:

Mississippi Ecological Services Field Office
6578 Dogwood View Parkway, Suite A
Jackson, MS 39213-7856
(601) 965-4900

Endangered Species

Proposed, candidate, threatened, and endangered species are managed by the Endangered Species Program of the U.S. Fish & Wildlife Service.

This USFWS trust resource report is for informational purposes only and should not be used for planning or analyzing project level impacts.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list from the Regulatory Documents section.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can only be obtained by requesting an official species list either from the Regulatory Documents section in IPaC or from the local field office directly.

The list of species below are those that may occur or could potentially be affected by activities in this location:

Birds

Red-cockaded Woodpecker Picoides borealis — Endangered

CRITICAL HABITAT
No critical habitat has been designated for this species.
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B04F

Wood Stork Mycteria americana — Threatened

CRITICAL HABITAT
No critical habitat has been designated for this species.
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B06O

Ferns and Allies

Louisiana Quillwort Isoetes louisianensis — Endangered

CRITICAL HABITAT
No critical habitat has been designated for this species.
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=S00T

Reptiles

Black Pine Snake Pituophis melanoleucus lodingi — Threatened

CRITICAL HABITAT

No critical habitat has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=C029

Gopher Tortoise Gopherus polyphemus — Threatened

CRITICAL HABITAT

No critical habitat has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=C044

Critical Habitats

There are no critical habitats in this location

Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity that results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish & Wildlife Service.[1] There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

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1. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

Additional information can be found using the following links:

- Birds of Conservation Concern
  http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Conservation measures for birds
  http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Year-round bird occurrence data
  http://www.birdscanada.org/birdmon/default/datasummaries.jsp

The following species of migratory birds could potentially be affected by activities in this location:

American Kestrel Falco sparverius paulus — Bird of conservation concern
Season: Year-round

American Oystercatcher Haematopus palliatus — Bird of conservation concern
Season: Year-round
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0G8

American Bittern Botaurus lentiginosus — Bird of conservation concern
Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0F3

Bachman's Sparrow Aimophila aestivalis — Bird of conservation concern
Season: Year-round
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B07F

Bald Eagle Haliaeetus leucocephalus — Bird of conservation concern
Season: Year-round
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B008

Brown-headed Nuthatch Sitta pusilla — Bird of conservation concern
Season: Year-round

Chuck-will's-widow Caprimulgus carolinensis — Bird of conservation concern
Season: Breeding

Common Ground-dove Columbina passerina exigua — Bird of conservation concern
Season: Year-round

Henslow's Sparrow Ammodramus henslowii — Bird of conservation concern
Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B09D

Kentucky Warbler Oporornis formosus — Bird of conservation concern
Season: Breeding

Le Conte's Sparrow Ammodramus leconteii — Bird of conservation concern
Season: Wintering

Least Bittern Ixobrychus exilis
Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B092

Lesser Yellowlegs Tringa flavipes — Bird of conservation concern
Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0MD

Loggerhead Shrike Lanius ludovicianus — Bird of conservation concern
Season: Year-round
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FY

Marbled Godwit Limosa fedoa — Bird of conservation concern
Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0JL

Mississippi Kite Ictinia mississippiensis — Bird of conservation concern
Season: Breeding

Nelson's Sparrow Ammodramus nelsoni — Bird of conservation concern
Season: Wintering

Painted Bunting Passerina ciris — Bird of conservation concern
Season: Breeding

Peregrine Falcon Falco peregrinus — Bird of conservation concern
Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FU

Prothonotary Warbler Protonotaria citrea — Bird of conservation concern
Season: Breeding

Red Knot Calidris canutus rufa — Bird of conservation concern
Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0DM

Red-headed Woodpecker Melanerpes erythrocephalus — Bird of conservation concern
Season: Year-round

Rusty Blackbird Euphagus carolinus — Bird of conservation concern
Season: Wintering

Sedge Wren Cistothorus platensis — Bird of conservation concern
Season: Wintering

Short-eared Owl Asio flammeus — Bird of conservation concern
Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HD

Swainson's Warbler Limnothlypis swainsonii — Bird of conservation concern
Season: Breeding

Swallow-tailed Kite Elanoides forficatus — Bird of conservation concern
Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0GB

Wood Thrush Hylocichla mustelina — Bird of conservation concern
Season: Breeding

Worm Eating Warbler Helmitheros vermivorum — Bird of conservation concern
Season: Breeding

Yellow Rail Coturnicops noveboracensis — Bird of conservation concern
Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0JG

Wildlife refuges and fish hatcheries

There are no refuges or fish hatcheries in this location

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

DATA LIMITATIONS

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

DATA EXCLUSIONS

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

DATA PRECAUTIONS

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

There are no wetlands in this location

ATTACHMENT C

Gravel Cover Construction Specification and Photographic Documentation

MEMORANDUM

TO: Eric Meitzler – Walker Hill Environmental
(601) 408-3419
eric@whenv.com

FROM: Gary Horwitch – EarthCon Consultants, Inc.
(713) 252-1581
ghorwitch@earthcon.com

DATE: 08-29-16

SUBJECT: Request for Quote
Aggregate/geomembrane Cover – IP Wigggins, MS
Purchase, transport, and placement

Eric:

Per our conversation today, and based upon prior conversations with Scott Schroeder of my staff, we need a formal quote from Walker Hill Environmental for the following items:

- Site Location
  - International Paper
    1633 South First Street
    Wiggins, MS 39577
- Purchase and delivery of 180 tons of grade 610 limestone
  PLC & Trucking, LLC (PLC)
  P.O. Box 1354
  Wiggins, MS. 39577
  Jeremy Smith
  (601) 528-4488
  Foreverchanged12@gmail.com
  PLC quoted $38/ton delivered
- Purchase and delivery of 1 roll – (10,350 square feet) 8-oz non-woven geotextile

EarthCon Consultants, Inc.
1880 West Oak Parkway
Building 100, Suite 106
Marietta, Georgia 30062
P: 770-973-2100
F: 770-973-7395
www.earthcon.com
Environmental Challenges BUSINESS SOLUTIONS ®

Hunter Floyd

Environmental Specialties International, Inc. (ESI)

(225) 291-2700 x 34

ESI quoted $1,718/roll delivered

- All materials deliver to the site by 9/6/16
    - 610 limestone and geotextile
    - Arrangements can be made with the Site so that materials can be dropped off prior to 09-06-16.
    - Staging area for materials delivered prior to placement to be determined and communicated to Walker Hill prior to start of placement work on Sept 6, 2016
- Placement
    - One area – 6, 012 square feet total per attached figure
    - Prepare area for geotextile placement
        - Remove any irregular material (e.g. rocks, debris, etc.) that will affect the integrity of the cover system
        - Place removed material as directed by the EarthCon Senior Engineering Technician.
    - Place geotextile
        - Stretched with no wrinkles
        - Provide one foot minimum overlap at all seams
        - Shingle seams to overlap from highest elevation over lowest elevation (Like roofing shingles)
        - Hold down corners of the geotextile using aggregate
    - Place 610 limestone in minimum one-6”thick lift
        - Do not drive directly on geotextile
        - Dump aggregate on geotextile to spread
        - Do not push aggregate across geotextile
        - Use low ground pressure tracked equipment to spread aggregate
    - Compact with rubber tire vehicle or tracked equipment
        - Two passes over each area
        - Perpendicular to each other.
        - Maximum 1-inch surface irregularity of compacted aggregate
    - Smoothly taper aggregate along edges
    - Remaining geotextile will be turned over to the EarthCon Senior Engineering Technician
    - Remaining 610 aggregate will be spread evenly over the closure areas and compacted as stated above.

- Supervision
    - Work will be performed under the direction of an EarthCon Senior Engineering Technician.
- Clean-up at the end of the project
    - Clean up all materials associated with the job and place excess materials as stated above.
    - Area should be visibly in an “as-before condition.
- Assume 2 days to in field to complete the work
    - Work hours – sunrise to sundown.

- Health and Safety
    - Provide EarthCon with copy of Walker Hill Health & Safety Plan (HASP) at least one-day prior to start of work.
    - Review, understand, sign-off on copy of EarthCon (HASP) provided to Walker Hill prior to start of work.
    - All work to be performed in accordance with property owner, Baldwin Pole MS safety policies and requirements, and applicable OSHA industrry/construction standards

- Lump Sum Quote
    - Materials
    - Labor for Installation
    - Equipment for Installation
    - Provide unit day rate for labor and equipment for extra days in field to complete work

AREA FOR GRAVEL PLACEMENT

ONE INCH = 50 FEET

0 50 100

INTERNATIONAL PAPER

Former Wood Treating Site Wiggins, MS
1633 South 1st Street Wiggins, MS

PROJECT NO. 02.20000006.16

EARTHCON®

EarthCon Consultants, Inc.

AREA FOR GRAVEL PLACEMENT

DRAWN:	CHECKED:	DATE:	FIGURE:
CHT	NK	MAY 2016	

FILENAME: gravel02262016.dwg

Photograph 1: Geotextile Underlayer & Gravel Placement

Photograph 2: Geotextile Underlayer & Gravel Placement

Taken By: Gary Gann Date: September 7, 2016	EARTHCON® *Environmental Challenges* *BUSINESS SOLUTIONS®* 1880 West Oak Parkway Building 100, Suite 106 Marietta, GA 30062	Gravel Cover Treatment Area No. 1 IP Former Wood Treating Units Wiggins, MS Project No. 02.20020008.15

Photograph 3: Compacted Gravel Cover

Photograph 4: Compacted Gravel Cover

Taken By: Gary Gann Date: September 8, 2016	EARTHCON Environmental Challenges BUSINESS SOLUTIONS 1880 West Oak Parkway Building 100, Suite 106 Marietta, GA 30062	Gravel Cover Treatment Area No. 1 IP Former Wood Treating Units Wiggins, MS Project No. 02.20020008.15